ANNALS OF THE ROYAL COLLEGE OF SURGEONS OF ENGLAND

VOLUME 26 MAY 1960 No. 5

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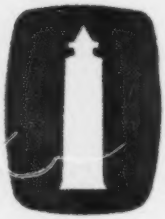

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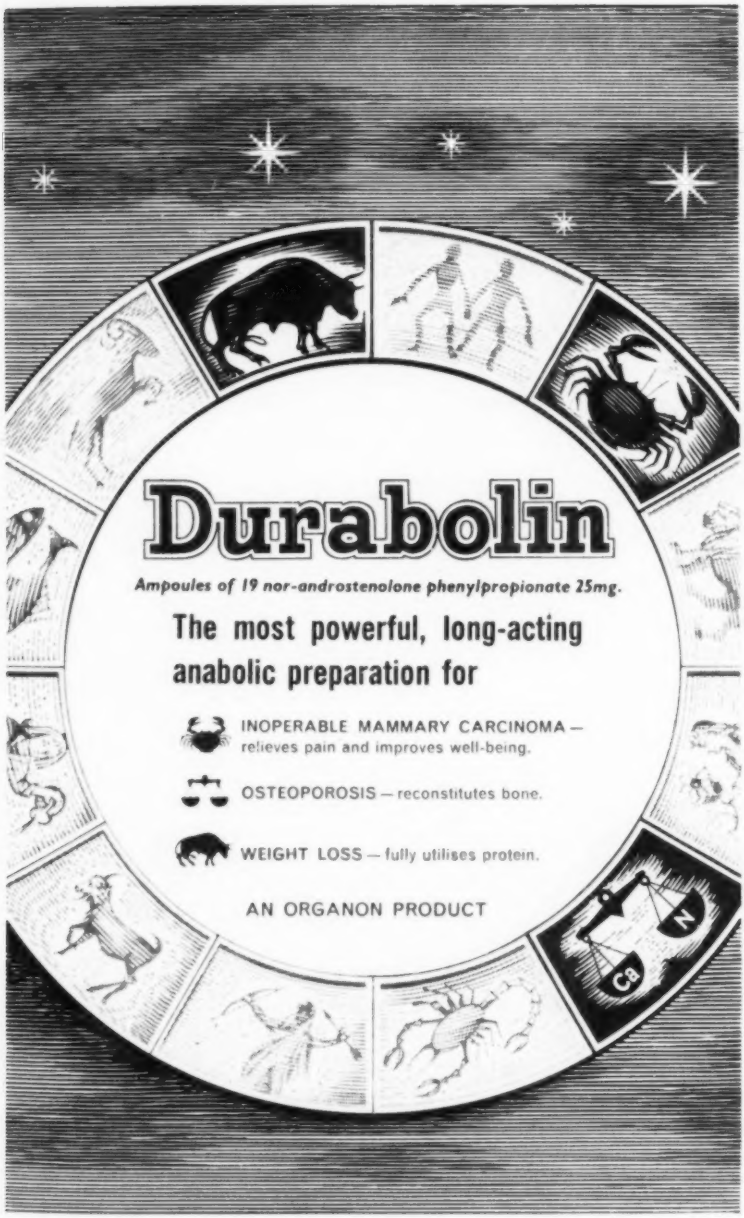
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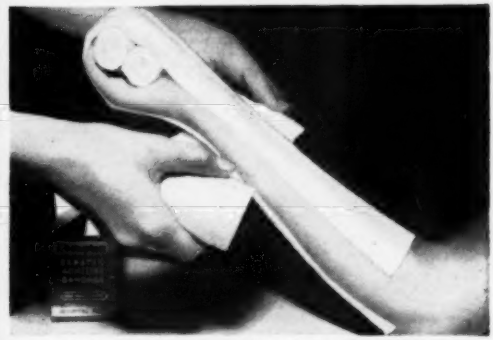

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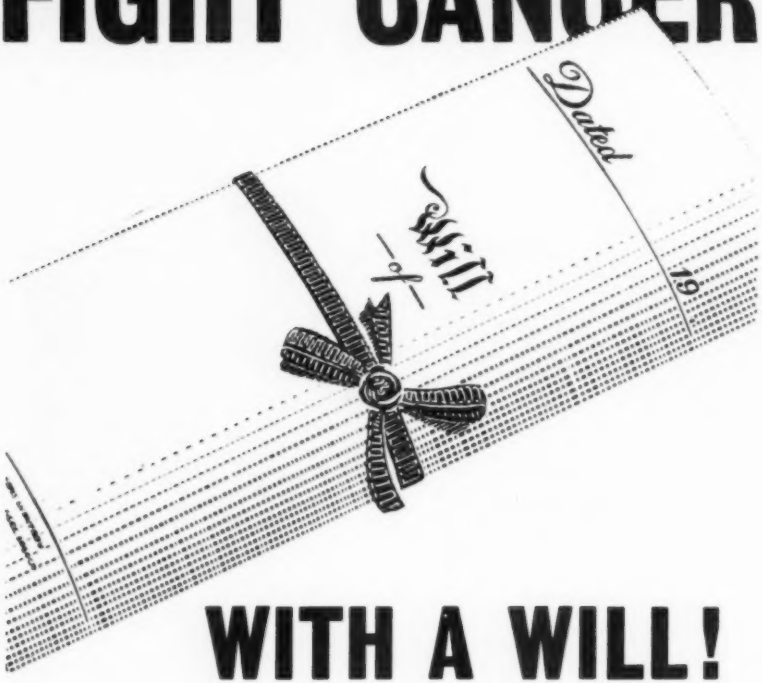

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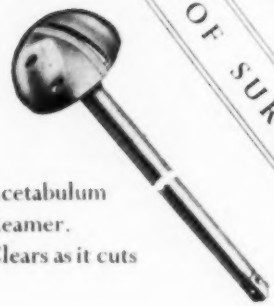

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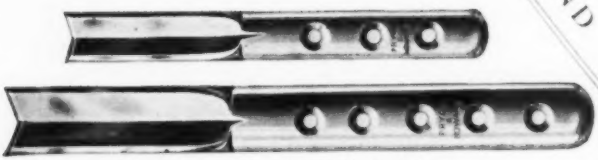

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ANNALS
OF THE
ROYAL COLLEGE OF SURGEONS OF ENGLAND

Editor:
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LL.D., M.Ch., D.Sc., F.R.C.S., F.R.S.E., F.F.R., F.D.S.R.C.S.

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ANNALS OF
THE ROYAL COLLEGE OF SURGEONS OF ENGLAND

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OPENING OF THE NEW LABORATORIES

Fig. 1. Miss Jennifer Riches presenting a bouquet to Lady Marks, watched by the President.

IT WAS WITH deep regret that we heard that Her Majesty Queen Elizabeth The Queen Mother would be unable, by reason of a sudden indisposition, to perform the ceremonial opening of the new laboratory block (Phase IIIA).

About four hundred people assembled in the Edward Lumley Hall on the afternoon of 29th March 1960, among them Fellows of the College,

members of the Staff, and many of the generous benefactors of the College, many of them accompanied by their ladies.

The guests included the Marquess of Salisbury (a Trustee of the Hunterian Collection), Sir Henry Dale (Chairman of the Wellcome Trust), Lt.-General Sir Alexander Drummond (M.D.G., Army), Air Marshal Sir Patrick Lee Potter (D.G.M.S., Royal Air Force), the Vice-Chancellor of the University of London (Dr. C. F. Harris), the Director of the British Postgraduate Medical Federation (Sir Francis Fraser), and representatives of the Royal College of Physicians of London (Sir Harold Boldero), the College of General Practitioners (Dr. G. F. Abercrombie), the British Medical Association (Dr. S. Wand), the Royal Society of Medicine (Sir Geoffrey Marshall) and the Master of the Worshipful Society of Apothecaries (Dr. R. R. Trail).

The Band of the Royal Army Medical Corps entertained the assembled company until the proceedings commenced with four processions—the Board of the Faculty of Anaesthetists, the Board of the Faculty of Dental Surgery, the Court of Examiners, and the Council with the Court of Patrons (the latter including several of the well-known College benefactors such as Lord Nuffield, Mr. Edward Lumley, Sir Simon Marks and Mr. Jack Cotton, and two Past Presidents, Sir Cecil Wakeley, Bt., and Sir Harry Platt, Bt.)—each robed in the appropriate academical dress of the College.

At 3.30 p.m. the President, Professor Sir James Paterson Ross, Bt., preceded by the Mace and accompanied by Lady Marks, the Mayor of Westminster (Group Captain G. H. Pirie), the two Vice-Presidents (Mr. A. Dickson Wright and Sir Stanford Cade) and the Chairman of the Building Committee (Sir Eric Riches), walked in procession up to the dais. After the playing of the National Anthem, a bouquet was presented to Lady Marks by Jennifer, the daughter of Sir Eric and Lady Riches (Fig. 1).

The President then addressed the company:

"Your Worship, My Lords, Ladies and Gentlemen:

"There is no need for me to tell you the news that all of you know already, but there is something I want to tell you that very few of you know about, and that is that Her Majesty sent her Private Secretary to the College a few moments ago with a message dictated by telephone from her bed. This reads:

> "'I am very distressed that a sudden attack of influenza has made it impossible for me to be with you this afternoon. I have been greatly looking forward to opening your new buildings and I assure you that my thoughts will be much with you.'

"Of course it would be idle to say that we are not very, very disappointed, but naturally that is overcome by our desire that Her Majesty will soon be well again from this acute attack of influenza. I was going to have started, naturally, by making an address of welcome to Her Majesty and to thank her not only for her intention of coming here today, but for many other indications she has given us over the years of the interest she takes in the welfare of the College; and then I was going to go on to

explain quite briefly the process of the rebuilding of the College so as to bring all of you up to date with the building operations that have taken place, and to explain really what stage we have got to today.

" In order to explain the process of rebuilding the College I will describe briefly the stages which we commonly refer to as ' phases '. Phase I, completed in 1954, consists of this Great Hall, now named the Edward Lumley Hall in acknowledgment of his generosity and his sustained interest in our work; and above it there are three storeys of Museums, the gift of the Wellcome Trust, represented here today by Sir Henry Dale. Also in Phase I is the Council Room, now named after Lady Marks, and a beautiful and valuable annexe to the Library presented by Mrs. Coulthurst in memory of her husband.

" Phase II, which was opened in 1957, is the Nuffield College of Surgical Sciences, which contains first-class living accommodation for 80 postgraduate students. The noble donor should be as satisfied with his gift as we are grateful for it, since it has become recognized throughout the Commonwealth as the most desirable residence in England for medical postgraduates. I should add, however, that this is not the only gift from Lord Nuffield, for in the building to be opened today is the Research Department of Dental Science which provides working space for the holder of the Chair in Dental Science which has been endowed by him.

" At the top of Phase II there are the laboratories of the Department of Anaesthetic Research with a Chair endowed by the British Oxygen Company, a gift which is deeply appreciated by the Faculty and by the Council of the College.

" Phase III has been divided into IIIA, which is the part of the building to be opened today, and IIIB, which has reached the stage of its foundations. We look forward to the completion of these building operations because then we will be able to provide room for the Professorial Departments of Biochemistry and Pharmacology which have been endowed through the generosity of Mr. Jack Cotton and Mr. Vandervell respectively.

" The College, being a Charity, must rely very largely upon the support of those who believe in its work and its aims. I would like to refer particularly to the generosity of the late Mr. W. R. Gibson, one of our own Fellows, and to the magnificent gift from Mr. Harold Samuel, but our friends are too many to be named individually, yet we wish them all to know how highly we value their continued interest as well as their gifts. In a moment I am going to ask Sir Eric Riches, the Chairman of the Building Committee, to describe briefly the allocation of space in the new building, Phase IIIA, but before doing so I would like to explain to you all that this building would not be there had Sir Simon Marks not come to our aid. With the collaboration of certain members of his family, whose names have been given to the various floors, the building has been completed, and stands as a permanent memorial to a wonderfully beneficent family who have made the welfare of the College a prime concern in their lives."

Sir Eric Riches then spoke:

" Mr. President, Your Worship, My Lords, Ladies and Gentlemen:

" Phase IIIA of the building, which is being opened today, was started in August 1955 and finished last year. It forms the westward continuation of Phase I, in which you are now, and just as the completion of this Great Hall marked the end of the beginning of the restoration of the College, so Phase IIIA marks the beginning of the end of that project. For administrative and financial reasons it was necessary to subdivide this final Phase. The work of the College had to continue and indeed it has never stopped despite some inconvenience from the noise of excavation and building operations. This is largely due to the skill and planning of the Architect and the Builders; their work was not easy, for new foundations had to be laid and access to the site was difficult. The new building, we feel, should stand firm for centuries.

" The upper floors, as the President has told you, are named the Simon Marks Laboratories. Sir Simon and his family and associates came to our aid at a time of great financial stress and by their generous help encouraged us to go forward with the full plan originally conceived by the late Lord Webb-Johnson.

" The arrangement of the floors is described in the brochure and I need only give a general account of the plans. Every floor contains laboratories for research work and

at the western end of each is a large demonstration room for teaching. It is appropriate that the Department of Anatomy should occupy the fourth or highest of the scientific floors. Sir Simon, as a Fellow of this College of three years' standing, you will doubtless appreciate the importance of a sound knowledge of anatomy in the training of a surgeon.

" On the third floor ample space has been provided for an enlarged Department of Research in Ophthalmology, a subject of fundamental importance in the study of diseases of the eye (Fig. 2). There is also a joint demonstration room for the Departments of Pharmacology, Physiology and Biochemistry.

" Pathology is a subject of such importance as to need the whole of the second floor together with the existing rooms nearby, which it already occupies.

" The Department of Dental Science has its Research Laboratories on the first floor, which also houses the Odontological Museum. This originated more than 100 years ago and is the finest collection of its kind in the Kingdom, and possibly in the world.

" The ground floor is not only the show piece of the building but provides rooms which were urgently needed for the many activities of the College. It also gives us an opportunity to commemorate some of our famous men. The statue of John Hunter,

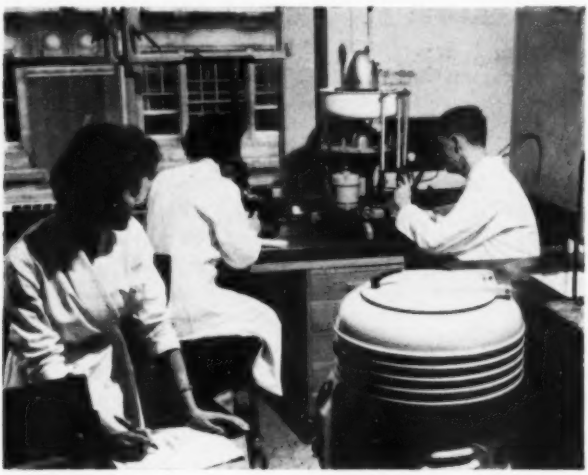


Fig. 2. Workers in the Department of Research in Ophthalmology carrying out respiration and histochemical studies of the retina.

completed by Weekes nearly 100 years ago, dominates the Rotunda; when the building is completed it will instantly catch the eye of the visitor entering from the front door. It survived the bombing, thanks to its enclosure in brick and reinforced concrete whence it was retrieved intact four years later.

" The two Committee Rooms, convertible into one large one, are in constant use in this age of Committees. One is named the John Cherry Gibson Room after the late Mr. W. R. Gibson, a Fellow of the College, and his brother-in-law. Its furnishings have been given by the specialist associations which are linked with and form an integral part of the College. The pear-wood cases of the two clocks were carved and presented by Mr. W. D. Park, F.R.C.S., and show that skill in surgery can be allied to skill in woodwork. The marble chimneypieces came from No. 148 Piccadilly on its demolition.

" The Fellows' Common Room perpetuates the memory of Sir John Bland-Sutton, President of the College from 1923 to 1926, and contains some of his furniture and the fireplace from his house in Brook Street; above it is his portrait by Sir John Collier.

" The last room leading from the west exhibition hall is a memorial to Sir Cuthbert Wallace, President from 1935 to 1938. It is a lecture theatre seating 150 (Fig. 3), provided with modern projection equipment. The acoustics are well-nigh perfect and no microphone is needed.

" The final phase, IIIB, is no longer just a plan for, as the President has told you, work has already started on its foundations although funds are still short. It will include as its central feature the rebuilt Hunterian Museum as well as the Departments of Pharmacology and Biochemistry, offices for the Joint Secretariat, a rare book room for the Library, and two lecture theatres, both air-conditioned. We hope it will be completed before the end of next year."

Fig. 3. The Cuthbert Wallace Lecture Theatre.

The President then spoke as follows:

" Your Worship, My Lords, Ladies and Gentlemen:

" Had it not been for our ill-fortune that the Queen Mother is not with us, at this moment she would have been graciously pleased to reply and also to declare the new building open, but to indicate how anxious is Her Majesty that we should continue even in her absence, her speech, which Her Majesty would have given at this point, has been sent from Clarence House and if I may I will now read it out for her.

" ' The work of the Royal College of Surgeons is continually expanding in pursuit of the ideal which prompted its foundation 160 years ago, and the perfection of the " art and science of surgery " remains its principal object. Since the beginning of this century, however, knowledge has advanced so rapidly that the scope of surgery has been greatly enlarged, and has come to depend increasingly on the allied medical sciences. It is to provide accommodation and research in these other subjects that the College has planned a building no less than three times the size of that destroyed in the war.

" ' The prestige of the College is universal. At home it sets a high standard of surgery by laying down requirements for the training of surgeons, and by examinations and the reward of prizes. It spreads its influence over the whole Commonwealth by taking in students, by sending examiners overseas, and through the Sir Arthur Sims Common-

wealth Professorships, whereby leading surgeons and physicians visit all parts of the Commonwealth, thus strengthening through personal contacts the links which build our British Family of Nations.

" ' Finally, in the international sphere, the College has been collaborating with the American College of Surgeons to form the International Federation of Surgical Colleges, which seeks to raise the standards of surgery throughout the world and to provide the benefits of modern surgery to all underdeveloped countries.

" ' As a Fellow of this College and as Chancellor of the University of London, I am happy to learn that both establishments have become closely linked through the British Postgraduate Medical Federation which is a School of the University. The Professor of Pharmacology already occupies a Chair in the University, and it is hoped that this happy alliance will be extended and that the Heads of all the scientific departments will eventually hold University Professorships.

Fig. 4. The President and Lady Marks, preceded by the Mace, leaving the Edward Lumley Hall after the ceremony.

" ' All this academic activity suggests that surgery is an art to be pursued as an end in itself, but, as in all art, a medium is required. In this case it is provided by the patient, and the aim of surgery is the relief of human suffering.

" ' I am sure that there are few people here today who do not feel deep gratitude for the skill of a surgeon and we all welcome the opening of a new block of the College. It will give teachers and research workers the extra accommodation they have longed for and will, I trust, be of the greatest benefit to them all—to the students, and to the College as a whole.'

" Then Her Majesty adds: ' It now gives me very great pleasure to declare open the new buildings of the Royal College of Surgeons '."

The President ended by saying:

"I am sure you will wish me to send a message to Her Majesty to thank her for her gracious message to the College today.

"I feel certain it would be in conformity with Her Majesty's wishes that we should continue this ceremony. After all, we only knew about Her Majesty's illness at half-past one today, and there was no time, of course, for any deputy to be appointed to take her place, and therefore I think it would be right and, as I say, in accordance with her own wishes that we should now inspect the new laboratories. I hope that all of you will have an opportunity of going round and seeing the buildings themselves and the workers in them and the work that they are doing."

The President, preceded by the Mace and accompanied by Sir Simon and Lady Marks and Sir Eric Riches, then left the Hall (Fig. 4), and inspected first the Committee Rooms on the ground floor and later the new laboratories, where they were introduced to the staff on each floor and shown some of the work being carried out in each Department.

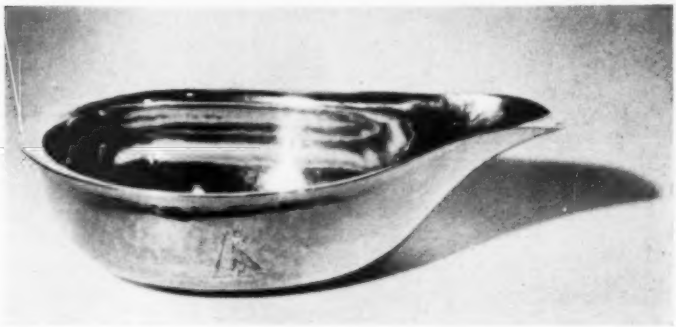


Fig. 5. The silver pap bowl which was sent to Her Majesty Queen Elizabeth The Queen Mother.

The gift of a silver pap bowl, which was to have been presented to Her Majesty Queen Elizabeth The Queen Mother as a memento of the occasion, was taken to Clarence House later in the day together with a message of good wishes from the President (Fig. 5). The bowl is dated 1775 and had a crest on one side of a stag trippant collared with a coronet. The College crest has now been engraved on the other side of the bowl.

There was also taken to Her Majesty the pair of silver scissors intended for the ceremonial cutting of a tape. These were the gift of the Architect, Mr. Alner W. Hall, M.C., F.R.I.B.A.

THE NEW BUILDINGS

Before the last war, the College buildings were unevenly spread over the site, for whereas the front portion facing Lincoln's Inn Fields was built

up to its present satisfactory height, the rooms at the back and in the centre of the block rose only to second-floor level. After these latter rooms had been destroyed or damaged in the war, the opportunity was taken to build up to the maximum permitted height. Moreover, the site itself was enlarged, partly by taking in two houses which already belonged to the College and partly by the acquisition of two additional sites. The result of all this has been that the new College, when completed, will have nearly three times as much floor space as the old. It had been foreseen, and has now been amply proved, that all of this extra space would be required to accommodate the vastly increased activities of the College.

As the President stated in his speech, the first phase of the rebuilding operations included the Edward Lumley Hall, the Miriam Marks Room (the Council Room), the three Wellcome Museums and the Coulthurst Room of the Library, as well as research laboratories, cloakrooms, stores and the boiler house. The memorial stone of this part of the building was laid by Her Majesty The Queen on 5th May 1953. The Great Hall was first used for a Hunterian Lecture on 22nd April 1954, followed a month later by a Sectional Meeting of the American College of Surgeons.

The second phase comprised the Nuffield College of Surgical Sciences, which came into use at the beginning of 1957 and was formally opened on 5th April of that year. Besides the eighty bed-sitting rooms for post-graduate students and their recreational rooms, this contains the Webb-Johnson Hall, the Howard Gray Memorial Library, the President's Lodge, the Research Department of Anaesthetics, and the kitchens which serve the whole College.

Phase IIIA, which was opened on this occasion, is to a great extent a completion of the first phase.

The upper floors are named the Simon Marks Laboratories after Sir Simon Marks, whose generous benefactions and those of his relations and associates have enabled the building to be completed.

The fourth floor (Matilda and Terence Kennedy Floor) is used by the Department of Anatomy and contains a dissecting room, demonstration room and research laboratories. These are in continuation of the suite already occupied by the Department for the last five years.

The third floor (Miriam and Harry Sacher Floor) houses the Department of Research in Ophthalmology, which was formerly restricted to a single room in another part of the building. Within this Department is the Wernher Group for Research in Ophthalmological Genetics supported by the Medical Research Council.

The third floor also contains a Demonstration Room shared by the Departments of Physiology and Pharmacology (Figs. 6 and 7).

Fig. 6. The President and Sir Simon Marks inspecting the electro-encephalograph machine in the Physiology Department on the third floor.

Fig. 7. The visit to the Physiology Department on the third floor. Left to right: Professor D. Slome, Sir Simon Marks, the President, Dr. Alec Lerner, Mr. Sacher and Mrs. Kennedy.

The second floor (Israel and Rebecca Sieff Floor) is devoted to Pathology and completes the suite of research laboratories already existing in the adjacent part of the building (Fig. 8). This floor also contains a Demonstration Room.

Fig. 8. The X-ray microscope in the Pathology Department used for taking radiographs of microscopic preparations.

The first floor (Elaine and Neville Blond Floor) contains the Odontological Museum, the only part of the Museum which came through the last war virtually unscathed. The remainder of the floor is occupied by the research laboratories of the Department of Dental Science (Fig. 9).

On the ground floor the central feature is the Rotunda, where has been placed the statue by Weekes of John Hunter, which will be visible from the

Fig. 9. Research work being carried out into the earliest chemical changes in dental caries in the biochemical laboratory in the Department of Dental Science.

front door when the building has been restored to normal conditions. From the Rotunda the Exhibition Hall is carried westwards and gives access to two Committee Rooms, the Fellows' Room and a lecture theatre.

The second Committee Room is named after the later W. R. Gibson, F.R.C.S. (and his brother-in-law), and the Fellows' Common Room after Sir John Bland-Sutton, President 1923–26, some of whose furniture it contains. The lecture room is a memorial to Sir Cuthbert Wallace, who was President in 1935–38.

The fourth and final phase of rebuilding (Phase IIIB) is now starting. By means of additions and alterations it will accommodate the Departments of Pharmacology and Biochemistry at the top, offices for the Joint Secretariat of specialist surgical associations, the Hunterian Museum, a Rare Book Room for the Library, and, on the ground floor, two lecture rooms.

APPOINTMENT OF FELLOWS AND MEMBERS TO CONSULTANT POSTS

A. HARRISON LEVY, F.R.C.S. — Consultant Surgeon to Singapore General Hospital and Consultant Thoracic Surgeon to Royal Singapore Chest Clinic.

The Editor is always glad to receive details of new appointments obtained by Fellows and Members, either through the Hospital Boards or direct.

JOSEPH CLOVER AND THE CONTRIBUTIONS OF SURGERY TO ANAESTHESIA

Joseph Clover Lecture delivered at the Royal College of Surgeons of England

on

16th March 1960

by

J. Alfred Lee, F.F.A. R.C.S., D.A.

Southend General Hospital

IT IS THE custom at these annual anniversary meetings of the Faculty of Anaesthetists to listen to a lecture given in honour of one of our great forebears, and this year it is my privilege to pay tribute to the memory of Joseph Thomas Clover, one of the early pioneers of the science and art of anaesthesia (Fig. 1). He was honoured by his contemporaries as a distinguished and inventive practitioner of the new skill, and we as his successors remember him as a medical man possessing great clinical facility and address, allied to very considerable ability in scientific investigation and research. As the successor to John Snow, not only did he become the leading anaesthetist of his day, but he laid the foundations of anaesthesia as a rational discipline, and made the state of anaesthesia a safe and not too unpleasant procedure. The details of his life have been very ably described to you by previous lecturers under this foundation

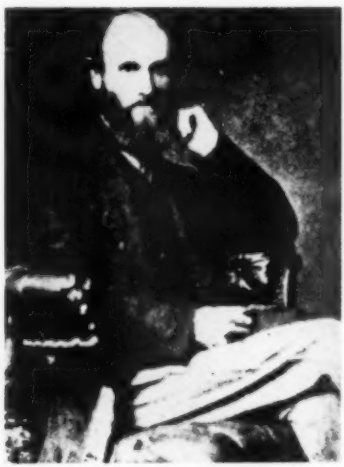


Fig. 1. Joseph Thomas Clover.

(Marston, 1949), but there will be some among my audience who will not mind if I refresh their memories.

Joseph Clover was born in Aylsham in Norfolk in 1825, was educated in Norwich and on leaving school became a dresser at the Norfolk and Norwich Hospital in 1842, and also acted as apprentice to a distinguished surgeon of the town, Mr. Gibson. In those days it was the custom for a man to become a trainee assistant before qualification rather than afterwards as now. His health broke down and pulmonary tuberculosis was diagnosed so that he was forced to alter his way of life and take more rest and relaxation by way of treatment. So good were the results of this

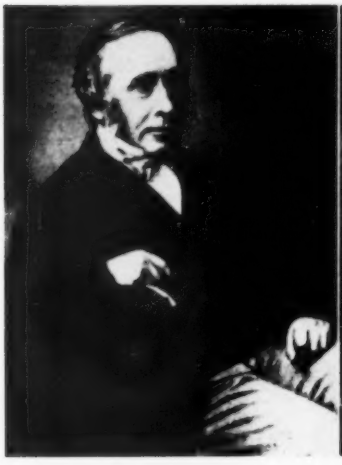


Fig. 2. James Syme.

Fig. 3. Joseph Clover.

regimen that two years later he was able to enter University College Hospital in London as a medical student, and so distinguished was his career there that within four years he was appointed resident medical officer. Clover was closely associated with James Syme (Fig. 2), later to become Lister's father-in-law, and when Syme left University College Hospital for the Edinburgh Royal Infirmary he asked Clover to accompany him and to take up the post of R.M.O. at that famous Hospital. But he preferred to stay in London and took his F.R.C.S. in 1850 and completed his training as a surgeon. It is possible that Clover was present in the operating theatre at University College Hospital on 21st December 1846, when Robert Liston amputated the thigh of Frederick Churchill when ether was given by Peter Squier, the first major operation

done under ether in England. This may well have triggered off the ambition which led to his devotion to the new science of anaesthesia which was to be his life work.

When the time came for him to leave his hospital in 1853, Clover settled in Cavendish Place in the West End of London, where he combined general practice with an ever increasing interest in anaesthetics. He fitted up a workroom in his house, and with his own hands made new pieces of apparatus for the improvement of his technique. Like some of his successors today, he appears to have been a lover of gadgets; but unlike them he had no commercial gentlemen to help in their development, as the

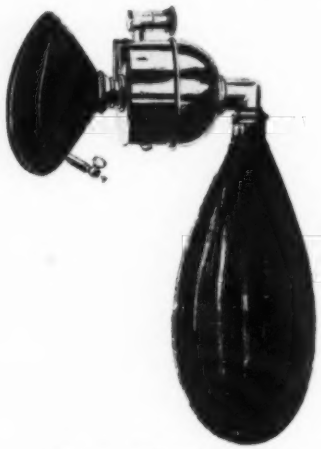


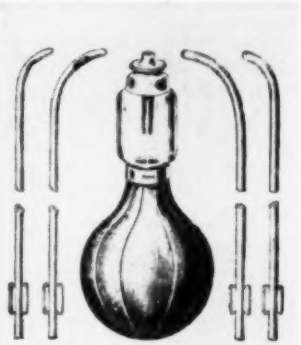
Fig. 4. Clover's inhaler.

market was far too small. As the years passed, Clover quickly established himself as the leading anaesthetist in London and obtained appointments at his old hospital, at the Westminster Hospital and at the London Dental Hospital.

In 1862, Clover, developing an idea originated by John Snow, devised an apparatus for the safer administration of chloroform. He filled a large bag with 4.5 per cent. chloroform vapour in air and from this the patient inhaled via a facepiece and tubing (Clover, 1862). Two years later, as the leading anaesthetist of the day, he took a prominent part in the investigations of the Committee, of which however he was not a member, set up by the Royal Medical and Chirurgical Society to inquire into the cause of deaths associated with chloroform anaesthesia. The Committee reported (Report, 1864) that chloroform was more dangerous than ether, but was nevertheless easier to administer, so rather irrationally suggested that the

two drugs should be used as a mixture. This was supposed to combine the advantages of both agents, the disadvantages being conveniently overlooked. Harley's A.C.E. mixture was strongly recommended, Harley being a member of the Committee! In 1868, Clover heard the American T. W. Evans give his paper on the excellent results he was getting for dental extractions with nitrous oxide (Evans, 1868), and this stimulated him to familiarize himself with the new or rather the rediscovered gas, and with Coleman, a dental surgeon, he designed apparatus for its successful administration. Convinced of the greater safety of ether, he used his great mechanical ingenuity in preparing apparatus for giving it with convenience to both patient and surgeon (Fig. 4), and in 1877 published his account of the portable regulating ether inhaler which simplified

Fig. 5. Clover's Crutch.



92.
ASPIRATOR, WITH CANULAS, CLOVER'S.

Fig. 6. Bladder evacuator.

induction of anaesthesia by preceding ether by nitrous oxide (Clover, 1877). This proved to be a boon which lasted for many years so that Blomfield, writing in 1922, was able to describe it, in its version modified by Hewitt (1901), as still a useful and suitable instrument in many cases (Blomfield, 1922).

But it must not be supposed that Clover's only claim to fame was as an inventor of anaesthetic apparatus. He was a man of great mechanical ingenuity and devised the well-known Clover's Crutch, a simple device to maintain a patient in the lithotomy position (Fig. 5). He was also the first man to invent a bladder evacuator for the removal of the small pieces of urinary calculus resulting from the crushing of the stone by Civiale's lithotrite. This preceded the improvement devised by the American, Bigelow, which is still used today (Fig. 6).

Such an eminent anaesthetist naturally had many distinguished patients under his professional care, including the Princess of Wales, later to become Queen Alexandra. In 1862, when Sir Henry Thompson, the famous surgeon and urologist, was consulted by King Leopold of the Belgians and advised him to undergo lithotrity, it was Clover who undertook the great responsibility of acting as anaesthetist; and ten years later, when the same surgeon was treating the Emperor Napoleon III, then a political exile in Chislehurst, Kent, and decided that painful examinations *per urethram* were necessary, he stipulated that Clover, who was generally believed to have no living equal as an anaesthetist at that time, must be engaged to give his skilled professional assistance to the Royal patient. Several administrations were necessary. Clover was thus not only the anaesthetist in these operations, but the inventor of one of the surgeon's most valuable pieces of apparatus (Cope, 1951).

It has sometimes been said that it was ill health which made Clover decide to forego the practice of surgery for that of anaesthesia. If that is so, then things must have changed during the past 100 years, for today an anaesthetist is no longer a weaker brother or a second-class citizen and requires just as much stamina and vigour as his surgical colleagues, although it must be admitted that some of his nervous energy is expended in different ways from those of the surgeon. In point of fact, however, Clover became a full-time anaesthetist by the route of general practice, and for two reasons. The first was because he could not stand the strain of a busy general practice and the second was because the field of anaesthesia in London was left wide open by the premature death of John Snow in 1858.

As a Fellow of this Royal College, it might be said that Clover was a surgeon who made highly original contributions to the sister art of anaesthesia, and I want to turn now to some other surgeons whose originality has added to our knowledge of pain relief. Much of this has been in the field of local analgesia and came about to our shame, because of the poor standard of general anaesthesia in the last quarter of the nineteenth and the first quarter of the present century. I am not of course suggesting that today regional analgesia is only justified where the standard of general anaesthesia is low; it is frequently the best method for surgeon and patient. Nor is it unexpected that surgeons rather than anaesthetists have made many of the advances in years past, for the evolution of the present-day anaesthetist started from very small beginnings, so that seventy or eighty years ago there must have been few men practising our specialty who had either the opportunity or the ability to contribute to the advancement of knowledge.

In the year that Clover died in London, Karl Koller (Fig. 7), inventor of local analgesia, took his M.D. degree at the University of Vienna. Koller was born in Bohemia in 1858, and as a young man interested in ophthal-

mology studied with Snellen of type fame in Utrecht. At this time the only forms of local analgesia were the Richardson ether spray (Richardson, 1866) and local freezing. Koller was impressed by the poor quality of general anaesthesia in ophthalmic surgery, and thought that the vomiting, retching and restlessness which so frequently followed it might cause damage to the eye. In an attempt to avoid general anaesthesia, he began to experiment with morphine, chloral and bromide, but without success. While he was an interne in the ophthalmological department of the Allegemeine Krankenhaus in Vienna, a young physiologist named Fleischl was being treated for a painful neuroma in the stump of an amputated thumb by Joseph Breuer and his associate Sigmund Freud. In passing it is interesting to note that Breuer in association with Hering has achieved eponymous fame with the Hering-Breuer respiratory reflexes (1868). Joseph Breuer was a highly respected medical man in Vienna and

Fig. 7. Karl Koller.

became the family doctor of Theodore Billroth the great surgeon and the first man to do a gastrectomy. The name of Breuer's associate, Sigmund Freud, later to become world famous as the founder of psychoanalysis, is known to us all. In the effort of Breuer and Freud to overcome Fleischl's addiction to morphine, part of the treatment consisted in the general, not local, administration of a little known drug cocaine, of which only a few grams were in existence, manufactured by Merck of Darmstadt. Freud took some of the drug by mouth, in experimenting on himself, and noticed that, in addition to its profound general effects, it caused numbness of the tongue (Jones, 1953). This numbing effect had been noticed in 1860 by Albert Niemann, but because of its profound general effects this action was overlooked. The well known story of how Freud interrupted his research because of the chance of a holiday with his fiancée, and suggested that Koller and another colleague Konigstein might care to pursue the

investigation of the numbing effects of cocaine further, is well known (Freud, 1935). Koller first used it to produce numbness in the eyes of frogs and guinea pigs, and later instilled it into his own eye and into the eyes of some of his patients. He quickly realized that in cocaine he had a new agent of profound significance in ophthalmic surgery. So eager was he to tell his colleagues of his new discovery that he hurried to Heidelberg, where the German Ophthalmological Congress was then in session. Although he was not down on the programme to read a paper, he persuaded a senior colleague, Dr. Brettauer of Trieste, to present his findings, and give a practical demonstration and, as may well be imagined, the report had a profound effect on its hearers. Thus was local analgesia born on 15th September 1884 (Koller, 1884), just two years after the death of Clover. Koller's discovery was reported in the *Lancet* on 4th October 1884, the first account of local analgesia in English, the same number which informed its readers that Sir Frederic Treves had been appointed to the consultant staff of the London Hospital, and carried an account of Dudley Buxton's modification of Junker's inhaler. English surgeons quickly took up the new discovery and Sir Henry Butlin described how Sir Felix Semon cauterized the inferior turbinate of a patient in an attempt to cure migraine, after painting the tissues with 20 per cent. cocaine solution; the patient was the author of the note, Butlin himself, who described perfect analgesia throughout the procedure (Butlin, 1884). The translation of a later paper by Koller appeared in the *Lancet* in December of the same year (Koller, 1884).

Koller was well aware that cocaine could be used in locations other than the eye, and with Jelinek used it in laryngology. Anton Woelfler, pioneer gastroenterostomist and assistant to Theodore Billroth in Vienna, was the first surgeon to inject it into the tissues. Karl Koller did not devote much attention to developing his new discovery as he wanted to make a name for himself in ophthalmology. After completing his military service in the army of the Emperor Franz Joseph, he emigrated to New York and soon joined the staff of Mount Sinai Hospital, where he had a distinguished career as an ophthalmic surgeon. He made some valuable contributions to his specialty and wrote many good papers (Koller, 1928). He died in New York, aged 86, as recently as 1944.

Koller's discovery was taken up by surgeons in many countries, and one of the more outstanding contributions was made by William Stewart Halsted (1885) of New York, later of the Johns Hopkins Hospital in Baltimore (Fig. 8). The tragic story of how Halsted, working at the Roosevelt Hospital with Hall and Hartley and not realizing the dangers of cocaine, became a cocaine addict, from adopting the maxim "every man his own guinea pig", is well known. While Hall and Hartley died as a result of their addiction, he was rescued from it by his friend and colleague William H. Welch, but was never the same man again. Halsted was

probably the first surgeon to employ nerve block when he injected cocaine solution into the mandibular division of the trigeminal nerve, so causing the lower jaw to become insensitive to pain.

A surgeon who made a fundamental contribution to the art of anaesthesia was August Bier (Fig. 9), the father of spinal analgesia. Although the method he discovered is not a very popular one today in Britain, it still holds its place and well may increase in popularity when we know for certain the cause, and can guard against, the occasional harmful sequel of arachnoiditis. Bier, one of the great figures of surgery on the Continent of Europe during the first half of this century, was born near Waldeck in Germany in 1861. As is common in his country of origin he was educated at several Universities and attended the medical schools at Berlin and

Fig. 8. William Stewart Halsted.

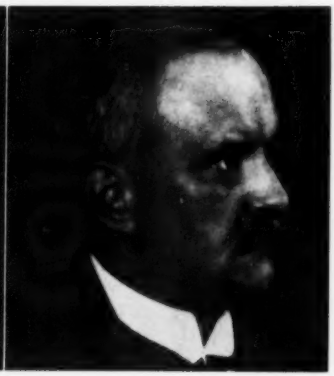


Fig. 9. August Bier.

Leipzig. He graduated in 1889 at Kiel and, deciding to devote his life to surgery, he became assistant to Professor Friedrich von Esmarch at Kiel. While there he supervised the change-over from the antiseptic to the aseptic system in the operating theatres. He moved on to Griefswald and in 1903 became Professor of Surgery at Bonn. So high was his reputation that four years later Bier was appointed to succeed the great Von Bergmann in the chair of surgery in Berlin, which he occupied for the remainder of his life and which he adorned as a master surgeon and a fine lecturer. In outlook and tradition August Bier was a loyal Prussian, and this led to his refusal of the invitation to follow Theodore Billroth in the chair of surgery at Vienna. Bier had an original and penetrating intellect and, in addition to discovering spinal analgesia, he was the originator of passive hyperaemia with the Esmarch bandage in 1907, which enabled him to treat tuberculous bones and joints with success, and he made original contri-

butions to the treatment of amputation stumps, to the study of blood transfusion, and to vascular surgery during the war of 1914–1918. In 1908, Bier described intravenous procaine analgesia, a method which produces analgesia of a limb when the local agent is injected into a vein distal to a compression bandage. This he called direct vein anaesthesia (Bier, 1908). He was an accomplished classical scholar and did serious research on Hippocrates and on Heraclitus. In 1913, at the International Medical Congress held in London, he was elected to the Fellowship of this College and in his own country became a Privy Councillor with the title of Geheimrat and was held in the highest esteem. Ferdinand Sauerbruch relates the amusing story of Adolf Hitler's rage at the thought that the Nobel Peace Prize for 1935 had been awarded to Karl von Ossietzky, and decided that he was going to found a German National Prize to honour in a pure Aryan way distinguished sons of the Fatherland; three deserving Germans were to be selected annually to receive the award, one to be a medical man. In 1937, Sauerbruch was asked to suggest a name and unhesitatingly named August Bier. When the prizes were awarded in the Opera House in Nuremberg, Bier shared the medical award with Sauerbruch, and both received 50,000 marks. It appears that each man recommended the other for the honour (Sauerbruch, 1953). Both were professors of surgery in Berlin.

The discovery of spinal analgesia was made in the early days in Kiel in 1898, sixteen years after the death of Joseph Clover (Bier, 1899). The story is well known how Bier, after successfully using the method in half a dozen patients, allowed his junior colleague to inject into his theca 2 ml. of 1 per cent. cocaine solution and how, presumably because of the large size of the trocar used, he developed a severe headache and was nursed by his chief's wife, Frau von Esmarch. Chaput, one of the pioneers of the revival of interest in ether in France, first used stovaine in spinal analgesia in 1905.

In later life, Bier deviated from the paths of orthodox science and came to be regarded by the younger generation as an eccentric has-been. He delved deeply into esoteric systems of philosophy and at the age of 70 he retired to the countryside, there to devote his closing years to tree culture. August Karl Gustav Bier died on his farm in the Russian zone of Germany in 1949, aged 88.

The pioneer work of August Bier was adopted by the well known French surgeon Marin Theodore Tuffier (Fig. 10). In France, anaesthesia had received little attention and chloroform, the routine agent, was administered by any student, orderly or nurse who happened to be available, with results which made careful and safe surgery difficult to attain. Tuffier at once saw that by employing the new method of spinal analgesia he could provide a quiet relaxed abdomen and at the end of the operation have a patient who was in reasonably fit condition. His first report on the method was written in 1899. He sought to employ it as a routine for all operations

below the diaphragm, and became much more of an enthusiast than did its discoverer, Bier (Tuffier, 1899). He was a man of original views and made other contributions to knowledge. With Hallion, he was a pioneer of insufflation endotracheal anaesthesia in 1896 and employed assisted respiration to overcome the effects of the open thorax; this enabled him to do a partial resection of a lung (Tuffier and Hallion, 1896). Two years later he massaged the heart of a patient who had died on the operating table, after resecting the ribs, but the effort at resuscitation was not successful (Tuffier, 1898), and indeed it was not until 1902 that Sir Wm. Arbuthnot Lane and Ernest Starling reported the first successful case of cardiac massage in a patient following collapse during operation (Lane and Starling, 1902).

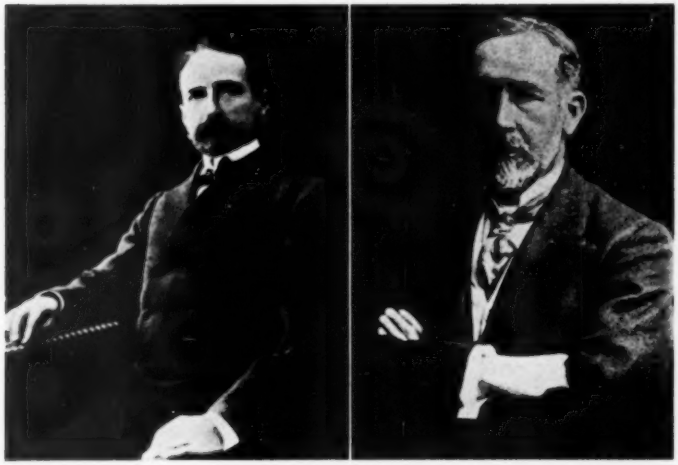


Fig. 10. Marin Theodore Tuffier. Fig. 11. Arthur Edward James Barker.

Tuffier was rather a difficult character and remained an *agrégé*, never attaining a professorial chair. He worked at the Hertford British Hospital in Paris, becoming in later years chairman of the committee, where he had many differences of opinion with British members of its Staff. He acquired a large and wealthy private practice and became, in foreign countries, one of France's best-known surgeons. He was awarded the Fellowship of this College at the International Medical Congress in 1913 held in London and, after the first World War, received from the hands of King George V the K.B.E. and the C.B. for his care of British troops. Tuffier was an early pioneer of blood transfusion directly from the radial artery of the donor to the saphenous vein of the recipient. On one occasion he is said

to have been so attentive to his patient, the recipient, that he failed to notice that the donor had fainted. Tuffier's advocacy of spinal analgesia did much to raise its status during the early years of the century.

Spinal analgesia came to this country largely owing to the foresight and enthusiasm of another great surgeon, Arthur Edward James Barker (Fig. 11), who was elected to the staff of University College Hospital in 1875, just seven years before the death of Joseph Clover. Barker, the son of a doctor, was born in 1850 and educated in Dublin. He rapidly attained a reputation as a brilliant young surgeon following a period of postgraduate work in Bonn, Germany. Here he became fluent in the German language so that throughout his career he was one of the chief bridges over which surgical ideas originating in Germany crossed into the English-speaking world, one of the most important of these being spinal analgesia.

Barker was one of the few men appointed to the staff of a London teaching hospital without the diploma of F.R.C.S., but a year after he arrived in Gower Street he obtained the Fellowship of the Royal College of Surgeons in Ireland, but had to wait another four years before his election *ad eundem* to the F.R.C.S. England. In the 1870s, U.C.H. was a centre of antiseptic surgery and we remember in this connection that Lister made his epoch-making discovery of the antiseptic system in 1865. Barker followed the aseptic teaching of von Bergmann and other German surgeons, and soon commenced to make surgical history. In 1886, he did the first successful gastroenterostomy in London for pyloric cancer, and his patient lived for a year afterwards. As there was no ear, throat and nose department in the hospital, he became a pioneer of the surgery of the middle ear, and the first surgeon to diagnose, then to localize and evacuate pus from, a cerebral abscess due to tympanic suppuration in 1886. Barker was a leader in the early diagnosis and treatment of intussusception and in the surgery of hernia. In 1899 he published *A Clinical Lecture and Demonstration on Local Analgesia*, using beta-eucaine 1 in 1,000 in normal saline (Barker, 1899), and in later years reported improvements in his local analgesia technique (Ba,ker, 1903). In 1907 came an account of 100 cases given spinal analgesia with stovaine (Barker, 1907) and in the following year he added 5 per cent. glucose to 5 per cent. stovaine solution to increase the density and limit the spread in the subarachnoid space. Before embarking on this new adventure he studied the work of Tuffier and Bier and came to the conclusion " that if we are to aim at localising our spinal analgesia to any particular region of the cord, we ought to employ the force of gravity acting upon an injected compound of greater density than that of the liquor spinalis ". He increased this density, not like Chaput by the addition of sodium chloride, but by the addition of 5 per cent. glucose. He emphasized the importance of the curves of the vertebral canal in localizing the level of analgesia and he invented the well known lumbar puncture needle.

Barker paid great attention to asepsis, a fine thing in one embarking on a series of subarachnoid injections. He insisted on a special sterilizer for his armamentarium, lest alkali should inactivate the stovaine. He was one of the first in Britain to wear a mask and sterile cap and gown, and was one of the very early surgeons to wear rubber gloves, a precaution first described by Halsted, but this habit he later discarded.

Alfred Barker held the position of Professor of Surgery at U.C.H. and after a full and busy life died of pneumonia and nephritis in 1916 at Salonika, during the first World War. As his obituary notice in the *British Journal of Surgery* so truly said, " The Profession in this country is deeply indebted to him for the share which he took in promoting the subject of spinal analgesia, and for recording his work in sufficient detail to enable others to practise the method with a great measure of success."

Fig. 12. Fidel Pagès.

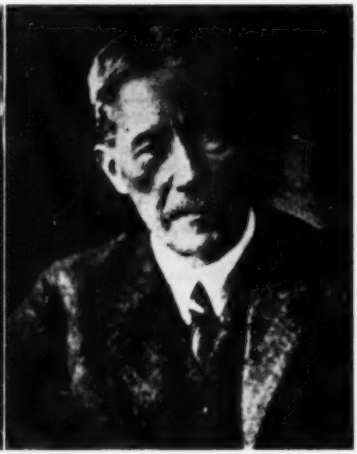


Fig. 13. Heinrich Braun.

A logical development of spinal analgesia was extradural block, and this too owes its introduction into practice to the imagination of men trained as surgeons, as was Joseph Clover. No description of the origins of regional analgesia would be complete without mention of the pioneer work of the young Spanish military surgeon, Fidel Pagès (Fig. 12), who in 1921 gave the first description of extradural block achieved by the injection of local analgesic solution into the lumbar rather than the sacral extradural space (Pages, 1921). Pages was killed shortly after the publication of his paper in a motor accident and was thus not able to develop the new technique which he had evolved and which has many advantages over

sacral or caudal block. His early death recalls that of Henry Hill Hickman, who was also prevented by an early death from persuading his colleagues to employ the method of pain relief which his ingenuity had devised. Lumbar extradural block lay forgotten for a decade until A. M. Dogliotti, also a surgeon, of Turin, described it afresh, believing himself to be the first to do so (Dogliotti, 1931). By pioneering the usefulness and practicability of extradural analgesia in this country, Massey Dawkins did a great service to anaesthetists here, as extradural analgesia increases our versatility and, when properly indicated, benefits our patients (Dawkins, 1945).

A surgeon who might be described as the Father of local analgesia was Heinrich Braun (Fig. 13), born on the first day of the year 1862 in Rawitch. He was from an early age an orphan, and this fact perhaps explains his reserved manner in later life. As a young man his first love was music, to which he hoped to devote his career, but his relatives encouraged him to study medicine, and a familiarity with the works of Goethe on natural history finally persuaded him to take this advice and to turn away from art to science. After qualifying he spent some time as assistant to Richard von Volkmann and was eventually appointed director of the Deaconess Hospital in Leipzig. Here his interest in local analgesia was developed, and he tried many new drugs on himself so that his forearms bore countless scars. He was more fortunate than Halsted, who became, through self-experimentation, a cocaine addict. Braun's final opinion, founded on years of experimentation, was that novocaine, prepared by the firm of Hoechst, was the best local analgesic agent available (Braun, 1905), and that he was right in his choice of this agent is proved by the fact that it held its place for the next 35 years, and today is still a reputable drug, and is incidentally much less expensive than more modern compounds which are not always necessary. Not content with putting novocaine on the map, and coining the term conduction anaesthesia, Braun was the first man to use the new active principle of the suprarenal medulla, prepared by Takamine in crystalline form in 1901 under the name adrenaline, to retard absorption and to prolong the analgesic activity of novocaine. He proved that 1 in 200,000 was the optimal concentration in local solutions (Braun, 1902). He now had the effective weapon and it only remained for him to devise suitable anatomical techniques to get the drug into the right areas to ensure complete pain relief and muscular relaxation for the operations he undertook. The results of his continued search are to be found in the successive editions of his textbook on local analgesia; the first appeared in 1905 and the eighth in 1933. It was later carried on by Arthur Läwen, who brought out the ninth edition, mainly his own work, in 1951.

Local methods were not Braun's only contributions to our specialty as he was a student of Paul Bert and was familiar with the discoveries made by this distinguished Frenchman in physiological and physical theory

(Bert, 1878). Braun devised apparatus for the administration of chloroform and ether vapour, and was well aware of the necessity of keeping the vapour strength of these volatile agents controllable and never too strong. He was able to publish the results of over 20,000 general anaesthetics administered with his apparatus without a single death, and firmly held that it is not anaesthesia but the impatience of the surgeon which is the danger to the patient if he demands too deep a level of anaesthesia and demands it too quickly.

In 1906, Braun was appointed to the directorship of the new hospital in Zwickau, to which he devoted the remainder of his professional life. Among other contributions he made was the invention of the well known Braun splint, and his method of blocking the splanchnic nerves and plexus from the front (Buhre, 1920).

Personally, Heinrich Braun was the antithesis of the prima donna surgeon and was a quiet, studious, artistic man who believed more in the value of example than in didactic teaching. He made a great feature of assisting his juniors in their operations and made the cogent remark: " My knowledge benefits few, my assistants' knowledge benefits many ". When he retired, science gave place to art, and he devoted the remainder of his life to music, painting and the care of his garden. He pursued his studies of Goethe and Feuerbach and greatly appreciated the music of Gabriel Fauré and of Richard Wagner. Heinrich Braun died in 1934.

May I now draw your attention to yet another surgeon who contributed greatly to our specialty of anaesthesia by pioneering curare, extradural and paravertebral block: Arthur Läwen, who was born in 1876 in Waldheim in Saxony and spent his youth in the beautiful city of Dresden. He studied in Rostock, Freiberg, Munich and Leipzig, qualifying at the last-named university in 1900. He found a congenial surgical teacher in Heinrich Braun, who, we have seen, looked upon the development of local analgesia as his life work, and who knew well how to instil enthusiasm into his pupils. Later, Läwen assisted Friedrich von Trendelenburg and then became chief surgeon at the newly built municipal hospital at Leipzig, and during the first war was consulting surgeon to the army, a post which he also held on the Eastern Front in Hitler's War. In 1919 he went to Marburg as professor of surgery, and eight years later assumed the chair at Konigsberg, succeeding Martin Kirschner, where he spent the remainder of his professional life. His surgical colleagues elected him president of the German Society of Surgeons in 1943, and in 1950 he became an honorary member of this famous society. During his life, Läwen wrote 14 monographs and over 160 papers on all aspects of general surgery and on local and general anaesthesia. Braun was able to write of his one-time assistant: " Läwen had in 1912 already found the key to today's anaesthesia, with intubation of the larynx, curare and artificial respiration." The contributions of Läwen to anaesthesia are indeed striking. In the field

of general anaesthesia he was probably the first man to try to obtain abdominal relaxation by the use of curare, which was supplied to him by Boehm, who gave it its formula (Boehm, 1920). He hoped by reducing the amount of general anaesthetic given to prevent post-operative chest complications. This was in 1912, before the first war. As the war became sterner on both sides, the Allied blockade of the Central Powers prevented further supplies from reaching Leipzig and, when all the stock was used up, the research was brought to a standstill, uncompleted (Läwen, 1912).

In the field of local analgesia, Arthur Läwen is credited with the successful development, following earlier work by Sellheim, of true paravertebral block, that technique which interrupts, not only the motor and sensory somatic fibres, but also the sympathetic efferent and the visceral afferent fibres. He was, too, the first man to block the five nerves supplying the lower extremity, so producing analgesia of the whole of the lower limb. Läwen is the real pioneer of extradural block, for although this method was described by Cathelin (1901) and Sicard (1901) in 1901, they obtained no success with the technique in general surgery in man. Under the name of sacral anaesthesia, given to it by Stoeckel in 1909, it had a vogue in obstetrics, but not until a year later was it made a practical technique in abdominal and pelvic surgery, when Läwen showed that novocaine in 1.5 per cent. or 2 per cent. solution with the addition of sodium bicarbonate would give a satisfactory sensory and motor block in a large majority of cases. He approached the extradural space from the sacral canal and proved that the use of big volumes of solution would produce a high block. Thus he showed that extra-dural block was a safe, efficient and useful technique (Läwen, 1910), more than 10 years before Pagès, and 20 years before Dogliotti popularized the lumbar approach to the space.

Läwen's last years were tragically overshadowed by political events, and in 1945, having already lost his only two sons in the war, he lost in addition his home, his clinic and his rostrum as a surgical teacher. Expelled by the conqueror from the East, he became like millions of his fellow countrymen a political refugee and, after severe deprivations, found sanctuary at last near Hanover in Western Germany, where he was able to see through the press the ninth edition of the *Textbook on Local Anaesthesia*, originally prepared by Heinrich Braun 46 years previously. Arthur Läwen died in Luneberg in 1958, at the age of 82.

Then one must not forget Curt Schimmelbusch, who in 1890 described the well-known mask for the open administration of either chloroform or ether. Schimmelbusch was an assistant of the famous von Bergmann in Berlin and he is remembered for his great contribution to surgical technique as one of the chief originators of the aseptic ritual which displaced the chemical antiseptic methods introduced by Lister in 1865 (Schimmel-

busch, 1892). It is seen, therefore, that while the principle of antiseptic surgery was developed by an Englishman in Scotland, its modern aseptic variant is largely the work of the Germans. It must be recalled, however, that Schimmelbusch's mask was a modification of the well-known mask devised by Skinner of Liverpool, also a surgeon, although as one chiefly devoted to the practice of obstetrics he was in 1862, when he described his mask, usually called a physician (Skinner, 1862). The difference between the original mask of Skinner and its later modification is that Schimmelbusch's instrument had a trough-shaped rim to catch excess ether or chloroform and so prevent it from injuring the face of the patient. Another well-known mask was that devised by Sir Alexander Ogston, professor of surgery at Aberdeen. It was so shaped that it deliberately encouraged the inhalation by the patient of accumulated carbon dioxide. In 1880, Ogston was the first to identify a new pyogenic coccus which he named staphylococcus aureus.

Then a very short glance at Gaston Labat, who was born in Mauritius in 1877 and educated there and in Montpellier in France. He became an interne in Montpellier and in Paris, and was later assistant to Victor Pauchet in 1918, one of the great French exponents of local analgesia. Here his work was greatly appreciated by the Mayo brothers, who visited him and invited him to become special lecturer in regional analgesia at the Mayo Clinic and the Mayo Foundation during 1921. He later practised surgery and local analgesia in New York City, where he became clinical professor of surgery and head of the department of regional analgesia in New York University and Bellevue Medical College. He was founder-president of the American Society of Regional Anaesthetists, and died in New York in 1934. Labat's book on *Regional Anaesthesia*, published in 1922, with a second edition in 1930, was a great stimulant to the practice of the techniques described therein, and its pictures were of a very high quality and in many cases have not been bettered.

Returning now from local to general anaesthesia, we must remember that the early development of endotracheal anaesthesia owed much more to the ingenuity of surgeons than of anaesthetists. This is in no way to belittle the immense contributions of our own colleagues, Ivan Magill (1920) and Stanley Rowbotham (1920), in the second decade of the present century. We must recall the pioneer work of Friedrich Trendelenburg (1871), professor of surgery at Leipzig, originator of the head-down position, the greatest contributor to hypoventilation excluding relaxants since respiratory obstruction was invented; pioneer of the operation for the cure of varicose veins (although his operation only consisted in tying the saphenous vein in the upper part of the thigh). Trendelenburg, in 1871, after performing a preliminary tracheostomy, fitted a wide-bore tracheostomy tube with an inflatable cuff, and so was able to protect the lungs from soiling during operations on the upper air passages.

Anaesthesia was maintained by pouring chloroform on to gauze over the mouth of the tube. The well-known Glasgow surgeon Sir William Macewan, in 1880, inserted a metallic tube from the mouth into the larynx and, after packing off the hypopharynx, removed a tumour from the base of a patient's tongue. Karl Maydl (1893), professor of surgery in Prague, was another contributor to the development of this most valuable technique and is today honoured in Prague for this work, where his photograph looks down on the amphitheatre in the University Surgical Clinic, next to that of the President of the Republic. After a gap lasting a decade, Fritz Kuhn (1901, 1902), of Cassel, interested himself in endotracheal methods, and eleven years later published a book on the subject (1911). He advocated inhalation of anaesthetic vapours through a wide-bore tube.

Interest in endotracheal anaesthesia now moved westward across the Atlantic and in 1909 two physiologists, Samuel Meltzer and John Auer (1909), working in New York, used the method in animals and this was applied clinically to man by Charles Albert Elsberg (1910) in thoracic surgery in 1910. The crucial experiments of Meltzer and Auer proved that an animal could be kept alive with a tube near its carina through which was insufflated air at a positive pressure supplied to keep the lungs distended, excess air escaping round the tube. For the experiment, the animal was curarized and it survived a long period of apnoea. This proved that respiratory movements are not necessary for life, a fundamental concept in physiology. It also proved that a simple method for combating pneumothorax during thoracic surgery was at hand; and lastly it showed that respiratory obstruction could finally be conquered, a great step forward in anaesthesia. When he applied the method to surgery in the abdomen, Elsberg showed that the quieter respiratory movements, together with the lessened descent of the diaphram, made manipulations easier. In the following year, Robert Kelly, surgeon to the Liverpool Royal Infirmary, visited New York and while there took the opportunity to see Elsberg at work. He was greatly impressed with what he saw, and on his return home set to work in the Department of Physiology in Liverpool, that department made famous by Charles Sherrington, and adapted and improved Elsberg's apparatus for the insufflation of ether vapour and air. Among his improvements were devices for warming and humidifying the vapour in an attempt to make it less irritating. The apparatus was manufactured by Down Bros. and was demonstrated by Kelly (1912) at the annual British Medical Association Meeting in Liverpool in July 1912. The vapour was blown into a narrow-bore endotracheal tube, placed near the carina, by an electric pump. Kelly, who was later Knighted, claimed that the chief danger of ether anaesthesia was respiratory obstruction, and this could be avoided by his tube, which he regarded as a method of artificial respiration first, and as a technique in anaesthesia second.

And so we see that our surgical colleagues sowed the seeds of many techniques which we as anaesthetists have taken up, developed and brought forth as useful and practical methods of pain relief. We salute them and, in doing so, remember that one of the earliest of their number was Joseph Clover, whom we are specially concerned to honour today.

In the obituary to Clover, who was 57 when he died, published in the *British Medical Journal* on 30th September 1882, the writer states that " Mr. Clover was well-known throughout the profession . . . as one of the most accomplished practical administrators of anaesthetics in the kingdom. The care and skill which he brought to bear on the practice of his profession in all its departments was especially notable in the administration of anaesthetics, and he also took an influential and active part in the introduction of nitrous oxide gas as an anaesthetic in this country. His gentleness and genialness of character endeared him to a large circle of friends and acquaintances. He had for many years been in delicate health, and had for many months been precluded from the active practice of his profession. His death will be felt by a large circle of attached friends and is a real loss to London practice."

In the notice of his death published in the *Lancet* (1882), the writer uses the charming phrase, " he became the companion of the leading surgeons in London at some of their most important operations ". Now surgeons have called anaesthetists some strange names, and names less strange, but the word companion is rather captivating, and describes a relationship which, if it is warm and friendly, will powerfully benefit our patients. Clover was regarded by his contemporaries, not only as an ingenious man, but also as a man of renown. When Nature has work to be done, she creates a great man to do it and no great man lives in vain. The history of science is but the biography of great men.

In bringing this lecture to a close, I cannot do better than quote some remarkable words spoken by a former President of this College, Sir Spencer Wells, in a Hunterian Oration delivered within these walls, or rather their precursors, in 1883, the year after Clover's death. " Probably no man in the whole world," he said, " during the last 20 or 30 years has done so much with his own hands to prevent or relieve severe pain as Joseph Clover. As an administrator of chloroform, or of some other anaesthetic, his services were in almost constant demand. For many years resident at U.C.H., then extensively occupied in general practice, he became so well known for his careful and precise mode of administering narcotic vapours or gas, that little time was left him for other pursuits. In some respects, although he supplied a real want in general practice, this limitation of his work is to be regretted; for the valuable improvements he made in several surgical instruments, especially in the double current

exhausting syringes, so useful in lithotrity and afterwards improved by Bigelow, prove that with less delicate health and more leisure his many friends would have been able to record more numerous and enduring memorials of the life-work of a singularly industrious man."

I would like to acknowledge the help in the preparation of lantern slides kindly given by the Photographic Department of the Southend General Hospital, the Royal Society of Medicine and the Royal College of Surgeons of England. I am also grateful to Mr. LeFanu, Libarian of the Royal College of Surgeons of England, and to Mr. Wade, Librarian of the Royal Society of Medicine.

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INTERNATIONAL FEDERATION OF SURGICAL COLLEGES

A MEETING OF the Executive Committee of the International Federation was held recently in Utrecht, with the President, Sir Harry Platt, Bt., in the Chair.

It was reported that W.H.O. had accepted the International Federation of Surgical Colleges for admission into official relations with the World Health Organisation. Sir Harry Platt was appointed as the Federation's representative to the Thirteenth World Health Assembly in Geneva in May 1960.

The Committee received reports on the progress of its working parties on Surgical Missions, the Training of Surgeons, and the Interchange of young surgeons between different countries.

Arrangements were announced for the 1960 meeting of the International Federation which is to be held in the Royal College of Surgeons of England on 18th-20th October. The theme of the meeting is to be " The Training of Surgeons ". There will be an open discussion of this topic and opportunity to see the practical application of the subject in the English College. There will also be research communications and a formal lecture. The other Colleges contributing to the programme of this meeting will be the Royal College of Surgeons of Edinburgh, the Royal College of Surgeons in Ireland, the Royal Faculty of Physicians and Surgeons of Glasgow and the American College of Surgeons.

ANATOMICAL MUSEUM

THE SPECIAL DISLAY for the month of May consists of a demonstration of documents relating to a Naval Surgeon's training and experience at sea.

CONGENITAL ANOMALIES OF THE URINARY TRACT IN RELATION TO DISORDERS OF MICTURITION

Hunterian Lecture delivered at the Royal College of Surgeons of England

on

8th January 1959

by

Richard A. Mogg, V.R.D., M.Ch., F.R.C.S.

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"*Nature creates monsters for the purpose of astonishing us and amusing herself.*"

THUS WROTE THE elder Pliny about A.D. 70 in his famous work *Naturalis Historia*, one of the most interesting books in the world, described later by his nephew and adopted son as " A rambling work full of learning, as free from monotony as nature herself ".

From earliest times the developmental anomalies and variations from the normal that occur in the human body have attracted the attention and stimulated the interest and curiosity of mankind. The clinician in all branches of medicine throughout its evolution has been fascinated and mystified by the protean manifestations of the anomalous formations. The importance of these anomalies in the production of abnormality of function and morbidity in the affected viscera has long been recognized, but not always fully appreciated. Congenital anomalies of the urinary tract have always proved a most fascinating study and have been described in detail in many of the standard medical works.

The subject-matter of this lecture represents the personal observations of a series of congenital anomalies of the urinary tract; the majority of these have presented for study in children. Congenital anomalies occur very frequently in the urinary tract, and no other system in the body has such a high incidence rate or such a wide variation in the type of anomaly. The incidence is very difficult to estimate with accuracy, but autopsy figures suggest that more than 10 per cent. of the population have some form of congenital anomaly of the urinary tract, which is a surprisingly high incidence rate. Conversely, not only is the incidence of congenital anomalies highest in this system, but they constitute 35 per cent. to 40 per cent. of all those found in other systems of the body. Their study is fascinating and attractive, and this is made even more pleasurable as the majority are seen in children, who in themselves are such a fascinating and stimulating group of patients.

The anomaly may be single, or multiple, and may be present solely in the urinary tract, or associated with congenital anomalies, either single or multiple, in other systems of the body. A particularly close association occurs with urinary tract anomalies and those found in the genital tract. This is only to be expected as both the urinary and genital tracts have a common site of origin. Common sites for associated anomalies are in the cardiovascular and skeletal systems. A satisfactory explanation of the association of congenital anomalies of the urinary tract with those in other systems of the body has not been given, but it must certainly be regarded as more than a mere coincidence.

In the cardiovascular system patent foramen ovale, patent interventricular septum and ductus arteriosus have a high incidence rate; while in the skeletal system congenital dislocation of the hip, anomalous or absent vertebral bodies are those most frequently encountered. In view of this very frequent association it is now my policy to investigate the urinary tract of all patients with anomalies of the cardiovascular, skeletal and genital systems. The anomalies of the urinary tract vary markedly as regards extent and degree of severity: the gross anomalies are quite incompatible with life and responsible for a high incidence of still-births and death in the neo-natal period. Lesser degrees are compatible with life, and in many cases a very full and uneventful one; but it is usual for the anomaly to produce some degree of morbidity in the urinary tract revealing its presence by producing symptoms of disorders of micturition.

Formerly these anomalies often remained completely undiagnosed and even unsuspected in patients presenting with disorders of the act of micturition. However, with more detailed investigation, these are being diagnosed and treated at a much earlier period. The disorders of micturition resulting from urinary tract infection are probably the most common presenting symptoms of these anomalies, and over 80 per cent. of the cases investigated had the presenting symptoms of urinary tract infection. Difficulty of micturition and failure to complete the act of micturition are important and common symptoms. It is surprising how long these symptoms can remain undiagnosed, especially in children of small families where the opportunity of meeting other children and observing the fundamental and basic mechanisms of the more intimate physiological functions does not occur. It is often only at school age, when the child mixes with other children, that the anomaly is discovered. Conversely, urinary incontinence, however slight, is a symptom which is not socially tolerated, and it is one which brings patients for investigation sooner than any other. It, too, is frequently the result of a developmental abnormality of the urinary tract.

It is not possible to discuss all the abnormalities of the urinary tract which are responsible for micturition disorders, and I therefore will

confine my observations to those which are most common or most interesting.

Before proceeding to discuss these various anomalies and to give illustrative cases, brief reference should be given to the developmental anatomy of the kidney. It is not proposed to give a detailed dissertation of the embryology of the urinary tract as this is given in standard textbooks of embryology, but a brief outline of some of the more important stages of development will be mentioned. It is well known that three separate structures—the pronephros, mesonephros and the metanephros—are concerned with the development of the kidney and that the pronephros and mesonephros degenerate, the latter only being represented by some vestigial tubules in the genital tract, namely the ductuli efferentes and the paradidymis in the male, the paroophoron and the duct of Gartner in the female. The latter structure is especially important because its persistence in the female often accounts for ectopic openings of the ureter in the vagina and the cervix.

At the 5 to 6 mm. stage the metanephros, or the permanent renal structure, consists of secretory and collecting tissue originating from the nephrogenic cord, while the mesonephros is degenerating. It lies in the region of the 2nd and 3rd sacral segments and there now appears from the angle of the Wolffian duct, at the site where it turns sharply forward to enter the cloaca, a ureteric bud which at first grows cranially coming in contact with the metanephros. The terminal ends of the Wolffian duct become funnel shaped and a caudo-medial loop formation occurs just proximal to the site of entry into the urogenital sinus. This loop formation at the 6 mm. stage causes a shift of the position of the opening of the ureter from its dorso-medial to a lateral position, which change is completed by the 14 mm. stage. Absorption of the terminal portion of the Wolffian duct into the primitive bladder produces the trigone, which is therefore entodermal in origin and not mesodermal as was formerly taught. The primitive kidney masses then undergo a relative ascent caused by the straightening of the tail curve of the developing embryo, together with a change in the shape and contour and rate of growth of the developing kidney. The metanephric masses at this stage are in close proximity with each other and are enclosed on each side by the large intra-abdominal umbilical arteries. While these changes are occurring there is a decrease in the size of the developing adrenals and liver allowing the kidney to acquire its permanent position. During its period of " ascent " there is at the same time a rotation of the long axis of the kidney from its primitive position, in which the pelvis and calyces face antero-posteriorly with the ureter emerging from the anterior surface, to the adult position, in which the calyces point laterally, the ureter emerging on the medial side. Therefore it is not surprising that a system such as the urinary tract, with such a complex developmental pattern, should have such a high incidence rate of anatomical variations.

ANOMALIES OF THE KIDNEY

Anomalies of number

Supernumerary kidney

This is not only a most interesting anomaly, but is the most rare of all renal anomalies. Carlson (1950) reviewed the 51 reported cases in the literature, giving a detailed account of the condition, and added two cases of his own. Supernumerary kidneys up to five in number have been described. Meredith Campbell reports an autopsy specimen of bilateral supernumerary kidneys, there being four separate kidneys and ureters. The anomaly is the result of splitting of the nephrogenic cap into two portions into which two ureteric buds open, but again may be ectopic in position. Each true supernumerary kidney has its own independent blood supply and ureter, which distinguishes it from the more common anomaly of fused supernumerary kidney, in which there is a common blood supply for the fused mass.

Campbell reports a most fascinating case in which supernumerary renal buds were found associated with other congenital abnormalities of the urinary tract. There was a bilateral pyelon duplex, and on the contralateral side there was an early renal sarcoma in the lowest portion of the kidney. The ureter of the supernumerary kidney is frequently ectopic in position, its orifice terminating at an extra-vesical site causing an intermittent type of urinary incontinence, the typical vertical incontinence to which reference will be made when discussing the anomaly of ectopic ureter. Stricture of the lower end of the ureter, which is a frequent finding, may cause infection of the kidney resulting in the intermittent discharge of a purulent or semi-purulent material from its orifice. Frequently, the ectopic ureter opens into the vagina or cervix, and it is the discharge of purulent material from the vagina often associated with vague loin or lower abdominal pain and tenderness that causes the patient to seek advice.

Treatment

Nephrectomy is usually necessary as the affected kidney is often disorganized as a result of infection and obstructive uropathy.

Case history

Supernumerary kidney

Mrs. W. (aged 36). The presenting symptom was that of intermittent purulent vaginal discharge associated with episodes of lower abdominal pain. Investigation showed that renal function appeared normal, but on the left side there was deviation of the course and dilatation of the left ureter, and below the left kidney was a soft tissue shadow.

Vaginal examination revealed a puckered area in the left fornix surrounded by granulation tissue which resisted all attempts at catheterization, though it was possible to insert a small amount of lipiodol into the " track " for a distance of 6 cm.

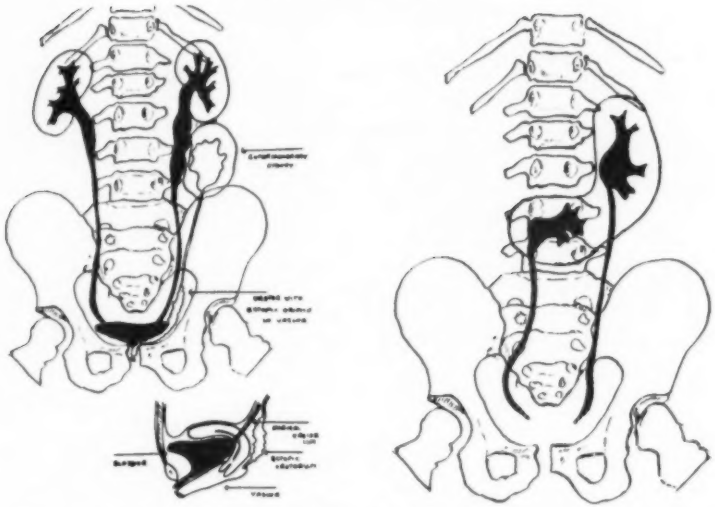


Fig. 1 (*a*) Drawing showing supernumerary left kidney with ectopic ureter opening into the vagina.

(*b*) Drawing showing " L " shaped kidney.

The patient was seen during an acute exacerbation of the condition at which time there was a palpable tender mass in the left iliac fossa lying below the normal kidney, and also a marked purulent discharge from the upper portion of the vagina (Fig. 1 (*a*)). Laparotomy revealed a supernumerary kidney which was a pyonephrotic sac with an anomalous yet completely separate blood supply from the aorta. Nephrectomy and partial ureterectomy was performed and it was seen that the ureter from the normal left kidney crossed the front of the pyonephrotic supernumerary kidney on its course to the bladder. Since operation she has remained symptom free.

Anomalies of form and position

Fusion of the kidneys

It is estimated that contra-lateral renal fusion occurs in about 1 in 400 individuals. Polar fusion is the most common type affecting either the upper or lower pole of the kidney, producing the horseshoe kidney, while combined upper and lower polar fusion gives rise to the discoid kidney. When dissimilar polar fusion occurs there results either the " S " or " L " shaped kidney, or the entire renal substance may be fused into a solid irregular mass of tissue to which the name of lump kidney has been given.

Anomalous vascular supply prevents the " ascent " of fused kidneys to normal position. Often the kidney itself is misshapen and defo med.

Anomalies of form and position

Sigmoid and " L " shaped kidney

Lower polar fusion of one kidney with the upper pole of the contralateral kidney produces these anomalies. In the " L " shaped kidney there is also rotation of the contralateral kidney so that its long axis lies transversely, whereas in the sigmoid or " S " shaped kidney the inferior pole of one kidney unites with the superior pole of the other, so that a long fused renal mass results. The condition must be distinguished from crossed renal ectopia, where the ectopic kidney lies in close apposition to the normal one but is only attached to it by loose areolar tissue. " S " and " L " shaped kidneys result when two normal ureteric buds grow into a common fused nephrogenic cap.

Autopsy figures give an incidence of this condition of 1 in 4,000 cases. The ureter of the ectopic portion of the kidney must of necessity run a tortuous and deviated course, usually entering the bladder in its normal position. Recurrent attacks of urinary infection are the common symptoms produced by these lesions and, when the fusion takes place on the right side, the palpable tender mass has often been mistaken for an acute appendicitis with abscess formation. Two cases of " S " and " L " shaped kidney are included in this series, a child of 6 and a boy of 18 years. The sigmoid kidney has been encountered personally on three occasions, the age groups being 12, 16 and 18 years.

Case histories

" S " and " L " shaped kidney

Miss A. N. (aged 6). This little girl was referred to the Urological Department on account of nocturnal enuresis associated with a chronic pyuria. Routine pyelographic studies revealed the typical " L " shaped kidney showing good renal function, but with inversion and rotation of the right half of the renal pelvis. Cystourethroscopy revealed a normal bladder and bladder neck. She also had a patent interventricular septum. The symptom of chronic pyuria improved with antibiotic therapy combined with ureteric catheterization and dilatation. (Fig. 1 (*b*).)

L. B. (aged 18). Admitted as an emergency with profuse haematuria following an injury playing rugby football. Routine pyelography showed an " S " shaped kidney with good renal function. Treatment was conservative, and mercifully there was an uninterrupted return to normality. (Fig. 2 (*a*).)

Anomalies of form and position

Ectopic kidney

The persistence of an anomalous foetal vascular pattern is the responsible factor for maintaining the kidney in an abnormal or ectopic position. Simple ectopia implies that the kidney is ectopic in position on that side, while in crossed ectopia it is either loosely attached to the contralateral kidney or lying on the contralateral side of the body. Abeshouse collected

337 cases of crossed ectopia and reviewed the literature, and quoting from autopsy figures he gave the incidence as 1 in 2,000 cases. Simple ectopia is usually unilateral and occurs approximately 1 in 800 cases. Ectopia in a solitary kidney is exceedingly rare, though some 42 cases have been described in the literature. There is a high incidence of pelvic ectopia in solitary kidneys. One example of this anomaly has been studied personally and included in this series.

The literature suggests that ectopia is more common in the male than the female, but in my personal experience of 10 cases, seven have been in the female, all of which have been associated with some abnormality

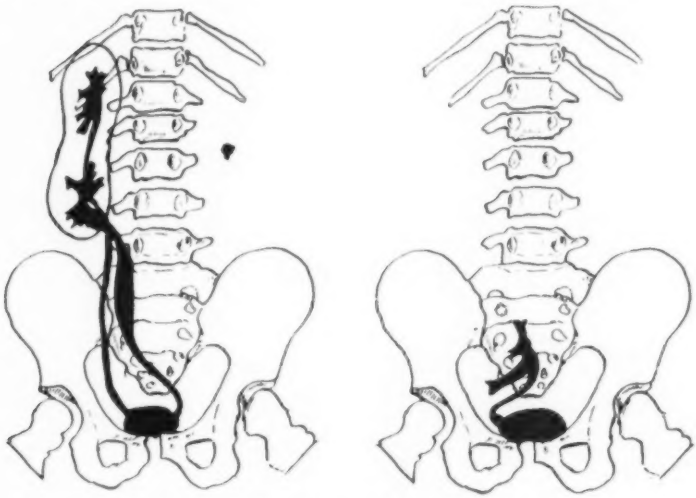


Fig. 2 (*a*) Drawing of sigmoid or " S " shaped kidney.
(*b*) Drawing of I.V.P. of a solitary pelvic kidney.

of the genital tract. The ectopic kidney is smaller than the normal, malrotated, lobulated and altered in shape with the ureter shorter than normal. The course of the latter may be tortuous and deviated on its way to the bladder. The arterial supply varies considerably, being derived from the neighbouring vessels, and may present a most bizarre arrangement. Genital anomalies are frequently associated with this renal anomaly. Absence of the vagina and uterus, hemiatrophy of the uterus, absence of the broad ligament and Fallopian tube or ectopia of the ovary on the affected side are some of the more common conditions. The distorted malformed ectopic kidney is usually subjected to recurrent attacks of urinary infection.

Treatment

Treatment depends on the presenting symptoms and the complicating lesions of the condition. Severe recurrent urinary infection of necessity demands nephrectomy, provided the contralateral kidney is normal. This operation when the kidney is pelvic in position can be extremely difficult.

Case histories

Ectopic kidney

Mrs. L. (aged 21). Admitted on account of lower left abdominal pain with the diagnosis of a left tubo-ovarian abscess. At the time of examination there was a very definite palpable tender mass on vaginal examination in association with pyrexia and abdominal tenderness. Laparotomy was performed and it was seen that the left tube and ovary, the left half of the uterus and broad ligament were absent. There was a malformed ectopic pelvic kidney. It was decided to conserve as much renal tissue as possible and the abdomen was closed, the pelvic kidney being left *in situ*.

Subsequent pyelographic investigations confirmed the presence of the pelvic kidney, and lipiodol injection of the uterus showed the typical appearances of the uterine abnormality. Following cystoscopy and retrograde catheterization of the left ureter this lady has remained well with the exception of one minor attack of pyelitis. In view of this no further operative intervention has been contemplated though should the attacks return or not respond to dilatation then removal of the ectopic kidney will have to be considered.

G. B. (aged 6). Admitted with severe lower abdominal pain, pyrexia and vomiting. Local abdominal tenderness with rigidity, rectal tenderness and signs of toxicity suggested an acute pelvic appendicitis. Laparotomy was performed, which revealed a normal appendix, but a solitary pelvic ectopic kidney lying in front of the sacrum on the right side. An acute pyelitis in the ectopic kidney had produced the symptoms described. Convalescence from the laparotomy was uneventful and the patient apart from one minor episode of urinary infection has remained fit and well for 9 years. Before discharge from hospital after laparotomy, cystoscopy and dilatation of the ureter was performed together with retrograde pyelography which confirmed the operative findings (Fig. 2 (*b*)).

D. B. (aged 30). Pelvic kidney, absence of vagina and uterus, unilateral ovarian agenesis, presenting with symptoms of recurrent urinary infection. This lady also presented certain characteristic features of Turner's syndrome.

URETERIC ANOMALIES

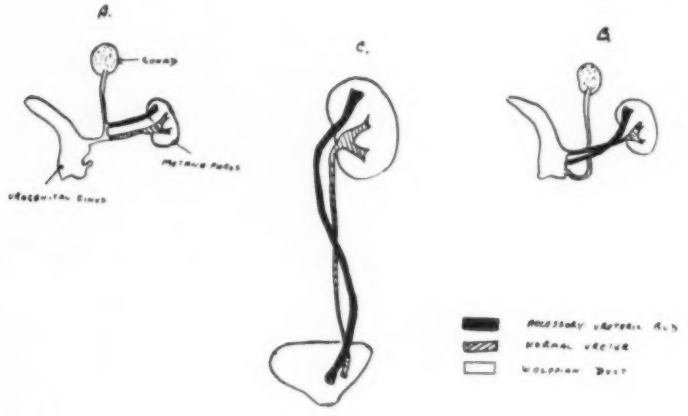
Anomalies of number

Duplication

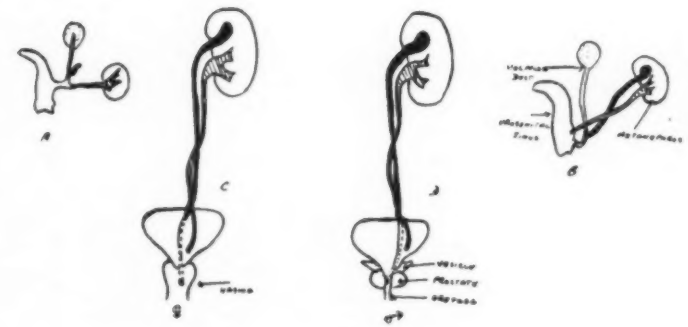
This very common ureteric anomaly is responsible for a high percentage of cases of acute and chronic urinary infection. The condition may be bilateral or unilateral. The normal configuration of the ureter and pelvis is referred to as pyelon simplex, all forms of duplication being embraced by the term pyelon duplex. Campbell in a most comprehensive review of this anomaly gives the incidence of the condition as 1 in 157 cases and in

30 per cent. of these it is unilateral and incomplete. The unilateral anomaly is six times more frequent than the bilateral one and clinically found more common in the female than the male.

The complete pyelon duplex results from the formation of an accessory ureteric bud from the elbow of the Wolffian duct and it lies close to the normal ureteric bud (Fig. 3 (*a*)). As normal development proceeds, both the ureteric orifices will therefore open into the bladder. If, however, the accessory ureteric orifice is found in the cranial portion of the Wolffian



(*a*)



(*b*)

Fig. 3 (*a*) Diagram showing development of complete pyelon duplex.
(*b*) Diagram showing development of pyelon duplex with ureteral ectopia.

duct, and therefore some distance from the site of the development of the normal ureter, it may not make satisfactory contact with the main body of the metanephros, in which case the pelvis and the calyces connected with the accessory bud will be poorly developed and smaller than normal. When the accessory bud arises some distance from the normal ureteric bud the incidence of ectopic insertion of the ureter becomes extremely high (Fig. 3 (*b*)).

The classification of Higgins and Innes Williams will be used when discussing ureteral duplication. The term protopyelon is used to denote the derivatives from the normal ureteric bud and this is invariably the larger component of a complete pyelon duplex. The smaller component derived from the accessory bud is referred to as the deuteropyelon. The course of the ureters in the complete pyelon duplex follows a stereotyped pattern, and this unfailing arrangement of the ureter constitutes the Weigert-Mayer law.

The ureter draining the deuteropyelon is first on the medial side of the normal ureter from the protopyelon in the upper third of its course. It then crosses to the lateral side in the middle third and again recrosses to the medial side in the pelvis and opens into the bladder on the medial side and inferior to the ureter from the protopyelon. Often these ureters are deficient in musculature resulting in irregular dilatations of their lumen. The orifice of the ureter from the deuteropyelon may have an ectopic position in the bladder and often opens as a ureterocele. When extravesical ureteric ectopia occurs associated with a pyelon duplex, it is normal for the ureter of the deuteropyelon to have the ectopic termination.

The renal parenchyma in cases of pyelon duplex is usually a single structure somewhat larger than normal, though there is occasionally a definite sulcus present on the surface indicating the line of junction of the two renal masses. There is, however, no communication between the collecting systems of each portion of the kidney. In addition there is often some abnormality of the cardiovascular system or of the skeletal tract. In 10 per cent. of cases of complete pyelon duplex other abnormalities of the renal system such as malrotation, renal ectopia or ectopic ureter are present, often associated with anomalies of the genital tract and the cardiovascular system.

The symptomatology of this condition is variable. The common presenting symptom is that of renal tract infection, frequency and dysuria associated with vague abdominal pain and tenderness along the course of the ureter. When the ureter is ectopic in position the symptoms depend on the site of opening of the ectopic ureter and these will be described in more detail when discussing the condition of ectopic ureter.

Treatment

Treatment is sometimes difficult, minor degrees of urinary infection as a result of the congenital anomaly frequently respond to ureteric dilatation, but in the more advanced type of cases, with gross changes in the upper urinary tract, partial nephrectomy and ureterectomy are required. Partial nephrectomy has been performed for pyelon duplex in some 50 cases without post-operative urinary leakage or haemorrhage and with gratifying results as regards symptomatic relief.

Case histories

Pyelon duplex

Miss L. (aged 19). First examined during an attack of right pyelitis with right loin pain, this being the second severe attack. Investigation revealed a complete pyelon duplex with hydronephrosis of the protopyelon associated with malrotation of the pelvis and calyces of this component part (Fig. 4). A partial nephrectomy and ureterectomy were performed with complete relief of symptoms (Fig. 5 (*a*)). This young lady was a nurse in training and she returned to finish her training which she completed without any further episodes of urinary tract infection. She has remained fit and well for the last five years.

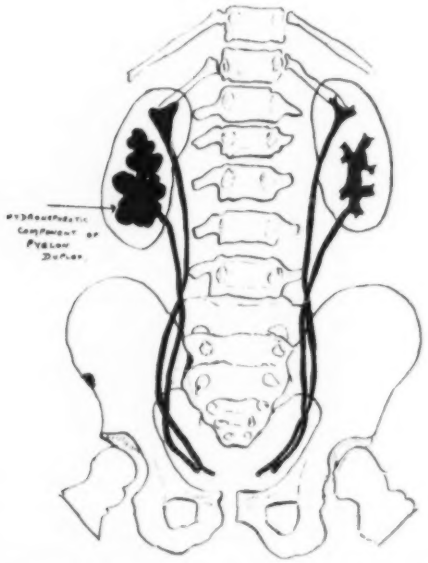


Fig 4. Drawing of I.V.P. of bilateral complete pyelon duplex (pre-operative).

Anomalies of implantation of the ureter

Ectopic ureter

This fascinating and interesting relatively common anomaly occurs three times more frequently in the female than the male. American autopsy figures give an incidence of 1 in 1,600 people, but it is my personal belief that this figure is too high. The ectopic ureter, as mentioned above, frequently occurs in association with a complete pyelon duplex, the ureter draining the deuteropyelon then has an ectopic opening. There is, in

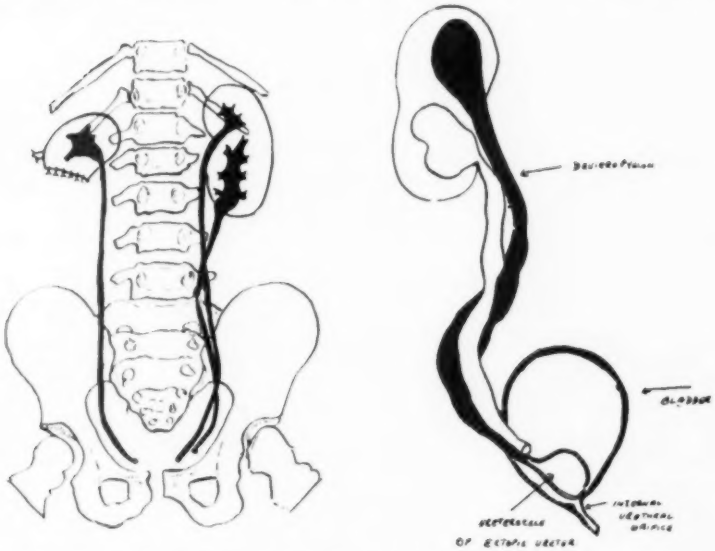


Fig. 5 (*a*) Drawing of I.V.P. after resection of right protopyelon.
(*b*) Drawing of complete pyelon duplex with ectopic ureter and ureterocele opening at the bladder neck.

addition, a high incidence of abnormality of formation of the lower end of the ureter, stricture or dilatation are the more common findings; the ureter itself is often deformed and deficient in musculature and its lumen is invariably dilated. The ectopic ureter, however, may occur without any evidence of duplication in which case it is then the only ureter present on that side. J. D. Fergusson has reported a case of bilateral ectopic ureter opening into the posterior urethra.

Numerous sites and variations in the manner of termination of the ectopic ureter have been discussed when dealing with the development of the renal system. In the male, the most common sites are the seminal

vesicle, the posterior urethra or the bladder neck, and in each case the ectopic ureter is under sphincteric control and therefore does not cause urinary incontinence, though it does produce on occasions symptoms of difficulty and urgency of micturition. Often there is intermittent macroscopic pyuria due to discharge of infected urine from the ectopic ureter.

In the female, however, the ectopic ureter commonly opens either in the wall of the urethra, the urethro-vaginal septum, the vagina or the cervix, and as in each case it is not under sphincteric control, symptoms of urinary incontinence result. It is regrettable that many of these unfortunate people are suspected of having enuresis and are treated accordingly;

Fig. 6. I.V.P. showing function in protopyelon of a complete pyelon duplex. The ureter of the non-functioning deuteropyelon had an ectopic opening in the posterior urethra.

a careful history as to the character of the urinary incontinence should readily lead to an accurate diagnosis. The patient often volunteers the statement that they pass urine normally, but there is always some slight, yet constant leakage of urine from the vagina between the acts of micturition. In addition the adoption of the recumbent position decreases and may prevent urinary leakage, but immediately the upright position is assumed incontinence of urine results. This symptom of vertical incontinence is diagnostic in the case of the ectopic ureter. Occasionally, the ectopic ureter may terminate as a ureterocele and in one of these cases, treated personally and recorded here, the ectopic ureter was associated

with a pyelon duplex with a ureterocele of the ectopic ureter which actually opened at the bladder neck. It was of such large size that it caused difficulty in the act of micturition even though the presenting symptoms were those of recurrent attacks of urinary infection (Fig. 5 (*b*)).

Radiological diagnosis may be difficult, as in a large proportion of the cases function of the affected upper segment is extremely poor and therefore a good outline is not always present on pyelography. One of the pitfalls of diagnosis is to regard the protopyelon, which is usually functioning adequately, as the total amount of normal functioning renal tissue on that side, whereas on careful study it is obvious that it is only a portion of the complete pyelon duplex (Fig. 6).

Gratifying and excellent results are obtained from partial nephrectomy when the ectopic ureter is associated with a complete pyelon duplex or nephro-ureterectomy in the case of simple ectopia where reimplantation of the ureter into the bladder is not possible. Reimplantation of the ectopic ureter of a solitary kidney into the bladder has been reported.

Case histories

Miss A. G. (*aged 26*). Presented with a history of dribbling incontinence, "enuresis", and recurrent attacks of urinary infection, which had been present since birth. The history was suggestive of an ectopic ureter on the right side, the orifice of which was found in the vestibule below and to the right of the normal urethral orifice. The orifice of the ureter was stenosed; catheterization was impossible though injection of indigo-carmine did show some secretion from the kidney revealing the exact size of the orifice. Pyelographic studies showed a moderately normal functioning upper pelvis and calyx belonging to the ectopic ureter, except that the calyx was dilated, round and the pelvis rudimentary. There was a normal arrangement of the calyces and pelvis in the protopyelon (Fig. 7 (*a*)). Partial nephrectomy and ureterectomy was performed with complete relief of symptoms and she has remained fit and well for 5 years since operation.

Anomalies of the ureter

Ureteric diverticulum

This condition may be congenital or acquired. It is proposed to deal with the rare type of congenital diverticulum which is in fact a true diverticulum of the ureter and contains the same muscular and mucosal layers as does the normal ureter. Thirteen cases of true diverticula of the ureter have been recorded. Culp (1947) reported one in the region of the uretero-pelvic junction holding 1,000 c.c. of urine. In another case, reported by McGraw and Culp (1952), the diverticulum was situated in the upper third of the ureter. The majority of cases reported have been in the juxtavesical area though a few were at the sacro-iliac level. The acquired diverticulum, similar to the acquired diverticulum of the bladder, develops as a result of back pressure. The diverticulum is in fact deficient in some of the ureteral coats, usually being composed only of mucosa and peri-ureteric cellular tissue.

The etiology of the congenital type is not entirely clear; it has been suggested that it may be an accessory ureteric bud which has failed to develop. Calculus formation is a common finding in a diverticulum, and when it attains a large size it may almost completely obstruct the normal ureter by extrinsic pressure (Fig. 7 (*b*)). Recurrent pyuria with loin pain, pain on micturition, urgency and frequency of micturition due to reflex irritation from the lower end of the ureter are the common presenting symptoms. It has been reported that rupture of the diverticulum can occur, but its main symptoms are the result of extrinsic pressure on the normal adjacent ureter.

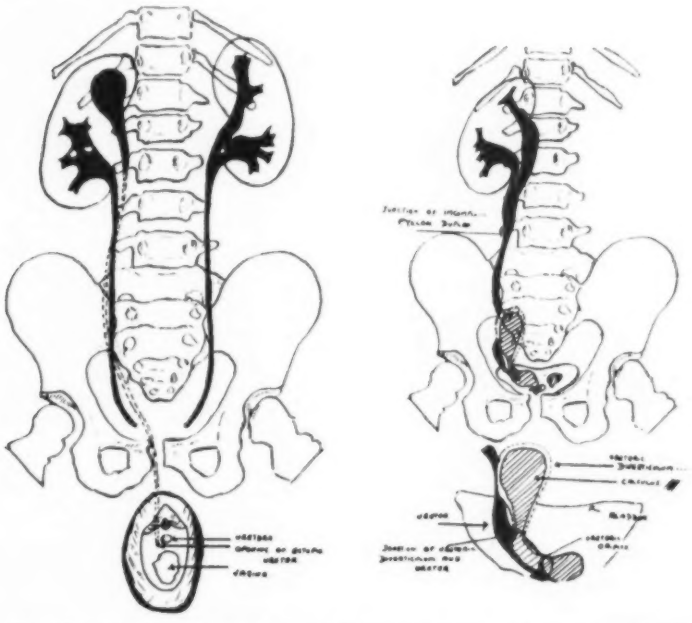


Fig. 7 (*a*) Diagram of complete pyelon duplex with ectopic ureter opening in the vestibule.

(*b*) Drawing of I.V.P. of ureteric diverticulum containing calculi.

Diagnosis can be difficult, especially in the absence of calculus formation. Retrograde and excretory pyelography often reveal the site of the diverticulum, but occasionally the true nature of the diverticulum is only apparent at operation. Review of the literature and personal communication from other surgeons who have reported cases of ureteric diverticulum have not given encouraging results in respect of local conservative treatment. Local

excision is often unsound and unsatisfactory, especially in the acquired type, as can be testified from personal experience.

It is not proposed to discuss the common anomaly of diverticulum of the bladder and its associated lesion in the bladder neck as these have been more adequately dealt with in two previous Hunterian lectures by Professor Alec Badenoch and Professor Ashton Miller. Therefore, I propose to discuss now some of the anomalies of the urethra.

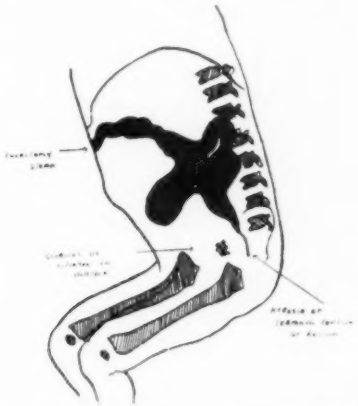


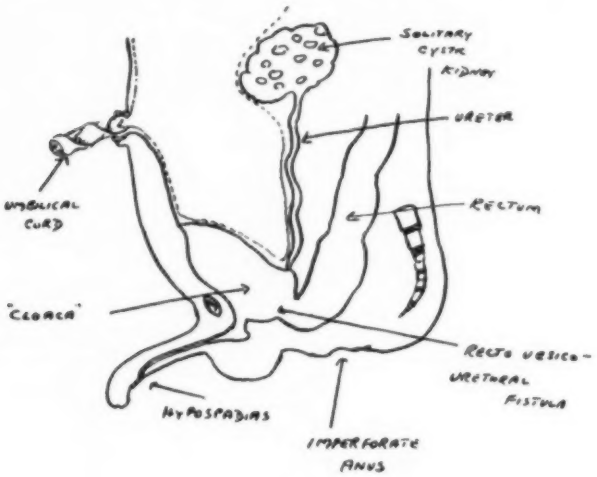
Fig. 8. Diagram of congenital urethro-rectal fistula.

Anomalies of the urethra

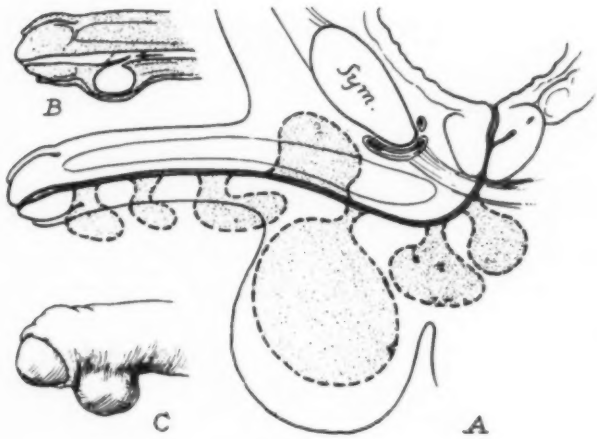
Congenital urethrorectal fistula (*Atresia ani urethralis*)

It is not always appreciated that the majority of cases of imperforate anus in the male have a fistulous communication with, or a fibrous cord attachment to, the posterior urethra. The site of the fistula or fibrous cord attachment is in the region of the verumontanum, usually below this structure. The exact aetiology of the condition has not been definitely decided. It may well be that the normal atresia of the tail gut which is seen between the 6 and 10 mm. stage has progressed beyond the limit of normality and affected the area destined to be the future rectum. This, naturally, would interfere with the normal formation of the urorectal septum; the rectum would then open into the urogenital sinus, or conversely become attached to it by a fibrous band. As previously stated, the usual site for the fistula is in the submontine region, so that any subsequent contraction of the atresic gut would of necessity pull up or kink the posterior urethra, causing it to be partially obstructed (Fig. 8). In rare

cases, the fistulous communication may be supramontine (i.e. atresia ani vesicalis); this condition is always associated by absent Wolffian derivatives (Fig. 9 (*a*)).



(*a*)



(*b*)

Fig. 9 (*a*) Diagram to show atresia ani vesicalis.
(*b*) Diagram to show the sites of urethral diverticula.

Surgical correction of the fistula can be difficult, and has a high recurrence rate. It is imperative to close it as soon as possible in order to prevent recurrent attacks of urinary tract infection. It is important also to recognize that, as there has been kinking and distortion of the posterior urethra due to the fistulous communication, the atresic rectum and posterior urethra must be completely separated and mobilized before any attempt to bring down the atresic portion of the rectum is undertaken. It is frequently very easy to increase the degree of posterior urethral obstruction by traction on the urethra in an attempt to mobilize the atresic rectum when the structures are not adequately mobilized.

These unfortunate children are the victims of recurrent urinary tract infection which may prove fatal. Treatment should be directed to separating and closing the fistula at the earliest possible opportunity as soon as the child is able to tolerate this operative intervention.

Anomalies of the urethra

Urethral diverticulum

This is a relatively uncommon lesion and may be either congenital or acquired; it is proposed to discuss only the congenital type. The lesion occurs in the floor of the urethra in its pendulous portion, the most common sites being in the region of the frenum, the peno-scrotal junction or in the bulb of the urethra. It has been suggested that the diverticulum may result from an abortive attempt to form an accessory urethral canal (Fig. 9 (*b*)).

Symptoms

The urethral diverticulum presents as a well formed local dilatation of the urethra which distends and becomes prominent during the act of micturition. The diverticulum fills with urine before urine is voided from the external urethral orifice, and then after the act of micturition urine gradually dribbles away from the meatus while the diverticulum is emptying. It is often noted that the terminal portion of urine to be voided and which comes from the diverticulum is purulent as a result of infection occurring in the diverticulum. If the diverticulum is of large dimension with a small orifice communicating with the urethra, it empties slowly and there is then a gradual leakage of urine into the urethra from the external meatus. This occurs in between the acts of micturition and is often confused with urinary incontinence.

Diagnosis

A swelling in the floor of the urethra is suggestive of a diverticulum. Urethrography and urethroscopy confirm the clinical findings. A midline

swelling in the urethral floor in the region of the peno-scrotal junction, resulting from a diverticulum, has been mistaken for an ectopic or supernumerary testis.

Treatment

Excision of the diverticulum with reconstruction of the urethra after urinary diversion either by perineal urethrostomy or suprapubic cystotomy. Associated anomalies such as stenosis of the external urethral orifice should be corrected at the same time.

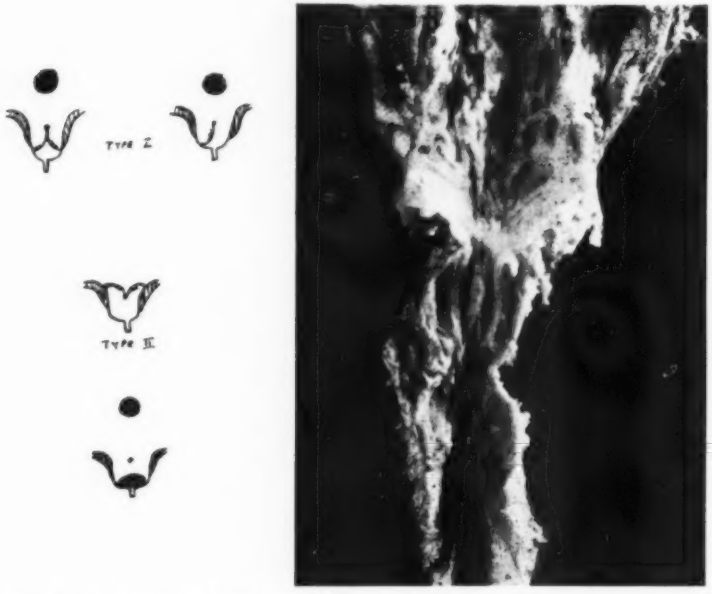


Fig. 10 (*a*) Diagram to show types of urethral valves (after Young).
(*b*) Photograph of posterior urethra to show urethral valves and posterior urethra.

Anomalies of the urethra

Congenital valves of the posterior urethra

This condition is more common than is appreciated, and conversely one in which the diagnosis is not always apparent even after complete urological investigation. It is responsible for a high proportion of chronic ill-health in male children and for the majority of deaths from urinary tract infection and renal insufficiency in the male child during the first year of life.

One of the difficulties of diagnosis is that there is no stereotyped clinical picture of the anomaly. The fact that it occurs only in male children, producing recurrent episodes of urinary tract infection and chronic vesical distension with or without signs of renal insufficiency, should at least arouse the suspicion of the clinician.

The valves are deep finlike mucosal folds often of paper thickness occurring in the posterior urethra of male children. They have a definite and constant relation to the verumontanum, being attached at one end to this structure. There is a great variation in size and formation, ranging from the deep cusplike folds of mucosa to elevated and projecting strands of mucosal tissue. It is usual for the valves to be bicuspid and they may remain free with prominent edges, though on the other hand fusion may occur anteriorly so that the lumen of the urethra becomes eccentric in position and reduced in size. The valves run downwards in an antero-lateral direction. On very rare occasions they have been described as running in a superior direction.

Young classified these valves into three well defined groups. In type I the mucosal fold or valve is attached superiorly to the verumontanum, the valves are usually bicuspid either fused or free extending downwards and laterally as far as the membranous urethra. Type II is rare and some doubt is cast as to its existence, the valve or valves usually being attached to the verumontanum running in an upward direction towards the bladder neck. Type III is the iris diaphragm type occurring at the level or slightly below the verumontanum (Fig. 10 (*a*)). Various theories have been postulated as to the aetiology of these valves. Persistence of the urogenital membrane, anomalous Wolffian or Mullerian remnants have been suggested as possibilities. It is now generally agreed, however, that they are in fact the persistence of the normal submontine mucosal folds which in the majority of children disappear in the pre-natal period.

Pathology

The morbid anatomical changes are the result of infravesical obstruction proximal to the urethral valves. The wall of the posterior urethra above the valves is thickened, elongated and ballooned, with an increase in size of the terminal portion of the trigonalis sheet of muscle which is inserted just superior to the verumontanum. The bladder neck is thickened from hypertrophy of bundles of circular muscle fibres which surround the internal urethral orifice (Fig. 10 (*b*)). The latter is frequently dilated with two characteristic lateral pouches or recesses of the bladder extending outward from it. Reference will be made to these recesses when discussing radiological investigation. The bladder wall is thickened and hypertrophied with sacculation and with formation of diverticula; the latter are especially seen when the condition is encountered later in childhood (Fig. 11 (*a*)). The ureters are tortuous, grossly dilated with dilatation of

the renal pelvis, and the degree of atrophy of the renal parenchyma varies with the severity and duration of the obstruction. Retardation or arrest in normal growth and development are also encountered, and the skeletal changes which are found are those normally associated with normal renal insufficiency.

Symptoms

These are legion, and there is no definite clinical picture of this anomaly. Urinary tract obstruction with renal insufficiency, frequency of micturition which has existed since birth, incontinence of urine, increasing vesical distension and paradoxical incontinence are the usual ones. In the

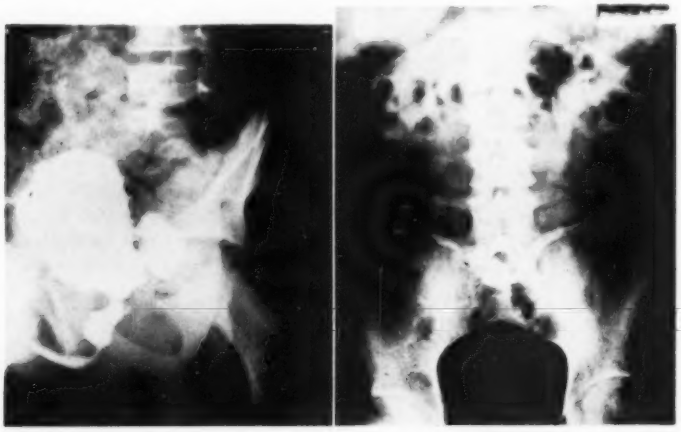


Fig. 11 (*a*) Cystogram of posterior urethral valves in a boy of 12 years.
(*b*) X-ray showing typical skeletal deformity of sacral agenesis.

absence of infection these symptoms are often regarded, erroneously, as those of enuresis. Hesitancy and difficulty of micturition with a marked reduction in the calibre of the urinary flow is also a characteristic symptom. Considerable straining is required in order to initiate and complete the act of micturition, and often these children will compress the abdomen in an attempt to force the urine from the bladder. The act of micturition may take an incredibly long time and only be accomplished with the greatest difficulty and pain. An unusual symptom which I have observed on two occasions is that of loin pain during the act of micturition; in one case it was so severe that it interfered with the act of micturition. The loin pain is due to ureteral reflux with transmission of pressure waves from the

contracting distended bladder up the ureter to the already grossly distended renal pelvis. This is a very real finding, the ureters and pelvis dilating to enormous dimensions during the act of micturition.

Diagnosis

The history and physical signs are important aids to diagnosis. Often the child is normal except when the signs of renal insufficiency are present, then there is frequently arrested skeletal development. Often the children show pallor and general listlessness with increasing abdominal distension resulting from the vesical enlargement, and there is always some degree of chronic retention present. Frequently, there is bilateral and palpable renal enlargement. Routine examination of the urethra and anal canal should always be performed; stricture of the external urethral meatus and neuromuscular dysfunction of the bladder must be excluded in the differential diagnosis. An important observation and one which should never be omitted is to watch the child during the act of micturition, and it soon becomes apparent there is some obstructive factor present. Many of these children have to kneel down and lean forward and assist the act of micturition by contraction of the abdominal musculature. Older children have often discovered accidently the value of manual pressure on the lower abdomen as a valuable aid to emptying the bladder.

Radiological diagnosis

This is a very valuable aid to diagnosis. Excretion pyelography may show changes ranging from a slight fullness of the ureters and renal pelvis to the most advanced and severe forms of hydronephrosis and hydroureter. The cystourethrogram is, in my personal opinion, a most valuable method of investigation and diagnosis. Distension of the bladder with sacculation or diverticulum formation with bilateral or unilateral ureteral reflux are common findings in the cystogram. The bladder neck is frequently normal in outline, but usually there is some elevation of the bladder neck with a typical lateral recess formation, this elevation is due to hypertrophy of the detrusor fibres of the bladder neck. I refer to this elevation as the "detrusor colliculus". The voiding cystourethrogram is another valuable diagnostic aid, though it is frequently a difficult investigation in a small child. Manual expression on the fundus of the distended bladder will, however, fill the posterior urethra and show the site of valve formation when it is impossible to get the child to void voluntarily. Cystourethroscopy is also a confirmatory method of diagnosis, but it does require to be performed with meticulous care as the actual valve formation in the posterior urethra may easily be overlooked. Rectal examination will often reveal the dilated posterior urethra, also the dilated lower end of the ureter.

Treatment

This depends on the degree of renal damage and the general condition of the child. Obviously in advanced cases, with symptoms of uraemia, preliminary drainage of the bladder has to be instituted before any treatment can be given to the obstructing valves. If, however, the general condition of the child permits, then removal of the valves should be performed at the same time as the preliminary drainage of the bladder. Three different methods have been used to remove the valves.

(1) *Transurethral approach*

Resection of the valves and bladder neck using a specially constructed small resectoscope is favoured by many urologists. It is often necessary to introduce the instrument into the urethra through a perineal urethrostomy. As mentioned previously when discussing the pathology of the condition it is most important to carry out an adequate resection of the hypertrophied muscle fibres of the bladder neck at the same time as the valves are destroyed. In my opinion it is not sufficient to remove the valves without treating the associated bladder neck obstruction.

(2) *Retropubic approach*

The posterior urethra is located and opened to expose the valves which are destroyed by diathermy under direct vision. It is also possible by this method to inspect and if necessary resect the bladder neck at the same time. This method of approach can be difficult and also a rather hazardous procedure in a small child. It is felt that this method is more suitable for children of the older age group.

(3) *Transvesical approach*

This method allows satisfactory exposure of the hypertrophied bladder neck so that adequate wedge resection of the hypertrophied tissue can be performed. Having resected the bladder neck, satisfactory visualization of the posterior urethra is obtained. On several occasions the valves have been visualized from above, by the retrograde passage of a urethroscope into the posterior urethra after the bladder has been opened and explored. This method has been used in the majority of the cases treated personally, though the retropubic approach offers many advantages. The transvesical approach, I think, does enable diverticula to be removed more easily, though it is a matter of personal choice as they can quite easily be removed when the retropubic exposure is used.

Neurogenic bladder in association with sacral agenesis

The most common symptom of this condition is that of retention of urine with paradoxical incontinence, but in some cases where there is

complete flaccidity of the bladder neck, urinary incontinence occurs without any associated retention. It is not proposed to discuss or elaborate on the observations, or to contribute to the very voluminous literature in respect of the neurogenic bladder. The classical works and observations of Emmett, Bors, Cosbie Ross and Gibbon, and of Ellison Nash and Innes Williams, are well known, and are authoritative works on this condition.

It is, however, proposed to discuss the interesting but rare lesion of sacral agenesis, which is associated with neurogenic dysfunction of the bladder. Five personal cases of this abnormality, each with varying

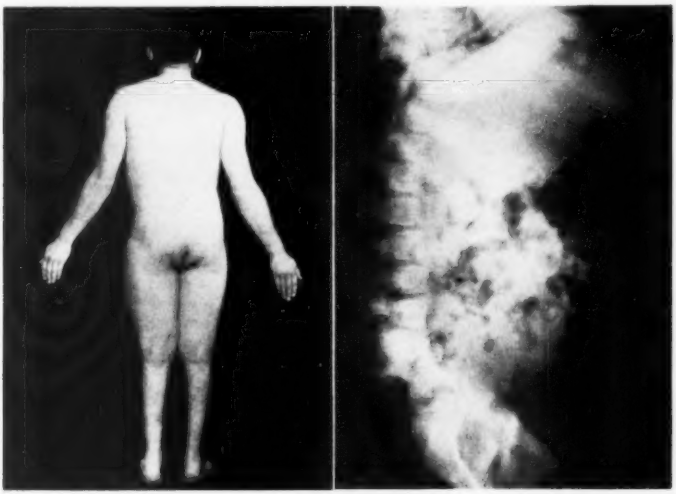


Fig. 12 *(a)* Photograph showing deformity of natal cleft and wasting of muscles of lower limbs associated with sacral agenesis.

(b) Lateral X-ray showing appearances of sacral agenesis.

associated congenital anomalies of the urinary tract, have been treated. Frequently, this abnormality presents with neurological symptoms as well as urological. Some alteration or disturbance of the act of micturition is the presenting symptom, the most frequent being that of retention with urinary incontinence.

Isolated cases of this condition have been reported and described by various writers. The first comprehensive survey of collective cases was by Freedman (1950), who added one case of his own. Innes Williams and Nixon (1957) reported eight personal cases classifying the various types of sacral agenesis. Frequently there is an associated abnormality

of the rectum, but sacral agenesis does occur with normal bowel formation, in which case the neurological disturbances associated with the sacral lesion are responsible for the urinary symptomatology. In the five cases of true sacral agenesis the age group varied from two to sixty years. All the cases had the characteristic feature of only one sacral vertebra which frequently showed abnormal development and irregularity of contour. In certain of these cases associated abnormalities of the lower lumbar vertebrae and skeletal systems were present (Fig. 11 (*b*)).

Abnormality of gait is not a common symptom, though in one case in this series it was present, associated with sensory loss in the perineum and medial side of the thigh, with wasting of the buttocks, producing the characteristic deformity of the natal cleft, and in addition wasting of the

Fig. 13. X-ray showing abnormality of lower urinary tract and skeletal deformities associated with sacral agenesis.

muscles of the lower limb (Fig. 12 (*a*)). Palpation and rectal examination will reveal the bony defect; anterior and posterior radiographs and lateral radiographs of the pelvis and lumbar spine confirm the suspected agenesis of the sacrum (Fig. 12 (*b*)).

The urinary symptoms are in no way proportionate to the degree of deformity, and vary from partial incontinence to complete incontinence. Associated congenital abnormalities of the upper urinary tract may also be present, though on the other hand it may be normal, but show evidence of an obstructive uropathy due to a neurogenic dysfunction affecting the lower urinary tract. Disturbances of rectal function with rectal inconti-

nence and absence of anal sensation occur. On occasions rectal continence is complete, permitting ureteric transplantation to be used as a method of treatment of the urinary incontinence.

The pathological anatomy is somewhat obscure, only one case in the series having been explored. Pugh at the Institute of Urology reported the findings in a girl of 12 who died from sacral agenesis, and his findings were similar to one of the cases in this series. The cord was split, unequally, irregularly, and longitudinally resembling the changes seen in diastomatomyelia, flattened in outline, but the actual nerve roots emerging from the lateral margins appeared to be normal.

Treatment

Treatment varies greatly with the symptomatology; minimal urinary symptoms can be treated by general supervision and re-education, training the patient to empty the bladder with the aid of manual expression or abdominal compression. The more severe urinary symptoms, however, require treatment either by ureteric transplantation, when rectal continence exists, or by the formation of an ileal or sigmoid bladder with an external stoma in those cases in which rectal control is impaired.

Case histories

Neurogenic bladder

B. E. (aged 2½). Presented in 1958 with urinary incontinence as a result of a chronic retention with overflow, with impairment of function of the urinary tract. There was very marked sacral agenesis, only one sacral vertebra being present. Cystogram showed ureteral reflux and an irregularly distended bladder with a wide dilated bladder neck. There were hemi-vertebrae and associated congenital dislocation of the hip on the left side (Fig. 13). There were deformities of both feet, talipes equino-varus type. Rectal control was imperfect and ureteric transplant could not be performed. Cystotomy was performed as a temporary measure with a view to further treatment at a later date. The child moved from the district and apparently died some four years later from renal failure.

P. H. Seen at the age of four years with complete sacral agenesis. Treated in the first instance with supra-pubic cystotomy on account of impaired function in the upper urinary tract and associated retention with overflow. Later transplantation of the ureter was performed in two stages as there appeared to be deterioration in renal function due to the neurogenic dysfunction of the bladder neck. At one stage, prior to the transplantation, owing to infection in the left kidney and a rise in the blood urea, a temporary nephrostomy was performed. An opportunity was taken to perform a retrograde ureterogram to see the actual contour of the left ureter and the actual condition of the uretero-vesical junction. This showed very beautifully the typical abnormality of the bladder neck and the proximal urethra. The patient is now aged 14, has developed normally and is a very attractive young lady having had quite a normal puberty. She has had minor episodes of hyperchloraemic acidosis, the blood urea varies between 60 and 70, and renal function, though impaired, is still quite satisfactory.

D. M. (aged 10). Seen at the age of eight with multiple congenital deformities, also hydrocephalus without any mental impairment—in fact, he was a very intelligent child. There was complete sacral agenesis, abnormalities of the lower lumbar vertebrae, also hypospadias and complete urinary incontinence. Routine investigation revealed a

Fig. 14. Photograph of solitary hydronephrotic pelvic kidney in a boy with sacral agenesis.

solitary malrotated hydronephrotic kidney lying just below the right sacro-iliac joint, the right ureter also being grossly dilated (Fig. 14). At operation the pyelographic findings were confirmed, there being a large right hydronephrotic sac in the region of the sacro-iliac joint, but complete renal agenesis on the left side. The left ureter was represented by a very small cord of fibrous tissue. An ileal bladder was constructed and the large dilated ureter was anastomosed to the ileum by a direct end-to-end anastomosis. He lived a perfectly satisfactory normal life for almost two years, only to die from progressive renal failure which followed an attack of urinary infection.

J. W. Seen in 1948 on account of urinary incontinence which had been present since birth. In addition this patient presented with the typical deformities which are seen in the buttocks, natal cleft and lower limbs. There was complete sacral agenesis, showing the typical deformity of approximation of the iliac bones and malformation of the 1st sacral vertebra, with anomalies of the lumbar vertebrae. In view of complete rectal continence this patient was treated by ureteric transplantation. During the last three years there has been a gradual rise in the blood urea and some deterioration in renal function, but there is still satisfactory function in both kidneys. The patient is now under supervision and the possibility of the formation of an ileal bladder at a later date may have to be considered if urinary function becomes progressively impaired.

M. W. (aged 60). First seen at the age of 35 on account of urinary incontinence, though there was a history of some frequency all her life with enuresis as a child. There was a complete sacral agenesis with rudimentary sacral vertebrae shown on the left wall of the pelvis producing a condition described as sacral scoliosis (Fig. 15).

Fig. 15. X-ray showing sacral scoliosis.

Rectal control was uncertain and there were changes present in the upper urinary tract. Treatment in the first instance was by an indwelling urethral catheter which was not tolerated well by the patient, and she elected to have a supra-pubic cystotomy performed which has made her relatively comfortable, though there has been intermittent urinary leakage from the urethra in spite of the supra-pubic cystotomy. The formation of an ileal bladder with an external stoma has been suggested to her, but she has very definitely refused this as a form of treatment and appears to be managing quite happily with supra-pubic drainage by a Foley catheter.

In conclusion, I have attempted in this lecture to evaluate the important relationship between the congenital anomalies of the urinary tract and the more common disorders of micturition. Medicine has evolved and developed rapidly and progressively through the centuries, and improved methods of investigation and diagnosis have enabled these anomalies to be appreciated at an earlier stage. However, even after almost 2,000 years, the words of Pliny must still echo though faintly, and ever remind us that " nature creates monsters for the purpose of astonishing us and amusing herself ".

Finally, Mr. President, I wish to express my most sincere thanks to the Council of the College for the honour they have conferred on me by electing me to give this lecture.

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PRESENTATION OF DIPLOMAS

THE ANNUAL CEREMONY for the presentation of diplomas will take place on Wednesday 8th June 1960 at 2.30 p.m. in the Edward Lumley Hall.

The occasion will be a general meeting of the College open to Fellows, Members and other diplomates of the College, and in the presence of this general meeting there will be a meeting of the Council at which an Honorary Fellow will be admitted and perhaps some elected Fellows. The Council will also grant diplomas of Fellowship to the candidates successful at the Final Fellowship Examination in May.

The Honorary Fellow to be admitted this year will be Professor Carl Semb of Oslo, and he will deliver a short address to the new diplomates.

The Fellows, Members, Fellows and Licentiates in Dental Surgery and Fellows in the Faculty of Anaesthetists who have indicated a wish to attend the ceremony will be presented according to their medical or dental school by a member of Council or Court of Examiners or appropriate Board of Faculty, and will individually receive their diplomas from the President. Each will be robed in the relevant gown of the College.

Fellows and other diplomates are most welcome to attend, and if possible should wear the appropriate academical dress of the College.

BOOKS ADDED TO THE LIBRARY

January—March 1960

Anaesthesia

EVANS AND GRAY (editors). General anaesthesia. 2 vols.
WOOLMER AND PARKINSON (editors). A symposium on pH and blood-gas measurement. Gift of Prof. R. Woolmer.

Anatomy

JAMIESON. Illustrations of regional anatomy, 8th edition, part 6: Upper limb.
LAST. Anatomy, regional and applied. 2nd edition. Gift of the publishers, Messrs. Churchill.

Anthropology

LE GROS CLARK. The antecedents of man.

Bacteriology

LUCAS AND CRAMER. Bacteriology for students of dentistry. 2nd edition.

Biochemistry

GEREBTZOFF (editor). Cholinesterases.
PEARSE. Histochemistry. 2nd edition.
STONER AND THRELFALL, editors. The biochemical response to injury (C.I.O.M.S. symposium).

Cancer

PARSONS (editor). Cancer of the breast.
RAVEN (editor). Cancer, Vol. 6. Editor's gift.
SHAW AND PAULSON. Treatment of bronchial neoplasms.

Cytology

CAUSEY. The cell of Schwann. Author's gift.

Genetics

CIBA. Biochemistry of human genetics.
PETERS. Classic papers in genetics.

Medical Practice

Royal Commission Report on Doctors and Dentists remuneration.

Medical Research

CIBA. Significant trends in medical research.

Neurology

BIEMOND (editor). Recent neurological research.
MAGOUN. The waking brain.
NOORDENBOS. Pain: problems of nerve impulses.
WYKE. Physiology of the nervous system. Author's gift.

Nutrition

The Heinz handbook of nutrition. Gift of the publishers.

Ophthalmology

BRINDLEY. Physiology of the retina and visual pathway.
MEYER-SCHWICKERATH. Licht-koagulation. Gift of Sir Henry Souttar.
ZAGORA. Okulistyka przemyslowa (in Polish). Gift of Prof. A. Sorsby.

Pathology

JONXIS (editor). Abnormal haemoglobins (C.I.O.M.S. symposium).
MCDONAGH. A final study of the nature of disease. Author's gift.
SMILLIE. Osteochondritis dissecans.

Pharmacology

British Pharmacopoeia 1958, Amendments. Publishers' gift.
British Pharmaceutical Codex 1959.
MAIR. Index to modern remedies. 9th series.
Pharmacopoeia Internationalis, Supplement.

Physiology

KNOWLES. Respiratory physiology and its clinical application.
LANSING. The arterial wall, its aging, structure and chemistry.
VASTERLING. Praktische Spermatologie. Gift of Sir Henry Souttar.

Surgery

COPE. Early diagnosis of the acute abdomen, Greek translation by Zolota and Ioannides. Author's gift.
HARBISON (editor). Contributions of C. C. Guthrie to vascular surgery.
ILLINGWORTH. Short textbook of surgery. 7th edition.
KAZANJIAN. Surgical treatment of facial injuries. 2nd edition.
MCGREGOR. Fundamental techniques of plastic surgery.
SOUTTAR. Textbook of British surgery, vol. 4. Editor's gift.
STICH-BAUER. Lehrbuch der Chirurgie. Gift of the Association of Surgeons.

Surgery, Orthopaedic

BECHTOL. Metals and engineering in bone and joint surgery.
CLARKE, BADGER AND SEVITT. Modern trends in accident surgery and medicine.
NIEDERECKER. Der Plattfuss. Gift of Sir Henry Souttar.
RANK AND WAKEFIELD. Surgery of repair: hand injuries. 2nd edition.
WILES. Essentials of orthopaedics. 3rd edition.

History of Medicine

BETT. A short history of nursing.
BRAITHWAITE. Lloyd George's ambulance wagon. Gift of Lady Webb-Johnson.
COPE. The Royal College of Surgeons, a history.
GUTHRIE. The Royal Edinburgh Hospital for Sick Children. Gift of the Hospital.
MORLEY. The opening of the neurosurgical unit at Toronto General Hospital. Gift of Mr. Dickson Wright.
NEEDHAM. A history of embryology. 2nd edition.
STOUT. Medical services in New Zealand in the Second World War. Editor's gift.
THORWALD. The triumph of surgery.

Biography

FLEMING, SIR ALEXANDER, by A. Maurois.
GRENFELL, SIR WILFRED, by J. Lennox Kerr.
RÖNTGEN, WILHELM CONRAD, by O. Glasser. 2nd German edition. Gift of Sir Henry Souttar.

Historic Texts

AELIAN on the Characteristics of animals. Greek and English edition by A. F. Scholfield, vol. 2 (conclusion).
ASCLEPIADES, his life and writings, by R. M. Green.
BRITISH JOURNAL OF DENTAL SCIENCE, vol. 1, nos. 1–6, 1856, completing the set (1856-1935) in the library. Gift of Mr. R. A. Cohen.
BURTON. Anatomy of Melancholy. 2 vols. 1826. Gift of the Hon. Herbert Bruce, F.R.C.S., of Toronto.
COOPER, SIR ASTLEY. Lectures on surgery. 3rd edition, 1832. Gift of Mr. St.John Buxton, F.R.C.S.
LAWRENCE, SIR WILLIAM. Diseases of the eye. 3rd edition, 1844.
LISTER. Six papers, edited by Sir R. Godlee. Gift of Mr. St.J. Buxton (a copy inscribed by Godlee for his father, Mr. D. W. Buxton).
MAIDEN. A case of recovery after accident. 1812. First edition of the case of Thomas Tipple, who was transfixed by a gig-shaft through the thorax and lived for twelve years. The specimens were in the College Museum till 1941.
TYSON. Essay concerning pygmies, edited by Windle. 1894.

Reference Books

DEFENCE MINISTRY. Guide to Government Libraries. 12th edition. Editor's gift.
LEFANU. Catalogue of Portraits, etc., in the College.
MUNBY. Cambridge College Libraries.
WOLF. A check list of English books of 1641-1700 in the Library Company of Philadelphia. Editor's gift.

LADY WEBB-JOHNSON has presented 50 volumes, 20 pamphlets or lectures, and a set of Hansard's House of Lords Debates 1948-57, from Lord Webb-Johnson's Library. Some of these, as listed below, have been placed by her wish in the Howard Gray library. Her gift includes autographed copies of Sir John Bland-Sutton's publications, books inscribed to Lord Webb-Johnson by their authors, and a copy of Leonce Benedite's sumptuously illustrated study of the sculptures of Rodin (1924).

Mr. A. H. BIZARRO, F.R.C.S., of Oporto, has presented 4 volumes of his philosophical essays, in Portuguese.

HOWARD GRAY LIBRARY

Fourth List (the Library was begun in February 1959)

Purchased by Mr. Dickson Wright's special fund for this library:

SINGER. History of technology, vols. 1–2, completing the series.
OXFORD HISTORY OF ENGLAND, vol. 13. The age of reform (continuation of series).

Lady Webb-Johnson's gift :

DAVIDSON. The Royal Society of Medicine.
FULTON. Life of Harvey Cushing.
HARE. Walks in London, 2 vols. 7th edition (1901), reprinted in 1923.
IRVING. University of Manchester sketches. 1904.
KEITH. Darwin revalued. 1955.
MASTERMAN. An Oxford guide-book. 1952.
POUCHET. The Universe. 12th edition. 1895.
"QUEEN MARY", *Daily Express* album. 1950.
TENNENT. Displaying Australia. 1947.
WATSON. Dawson of Penn. 1950.

DOWN HOUSE LIBRARY

CHARLES DARWIN. Autograph diaries for 1874–1882. Gift of Lady Keynes.
CHARLES DARWIN. Journal, edited by Sir Gavin de Beer; Notebook 1, edited by the same. Editor's gift.
LADIGINA-KOHTS. Constructive and instrumental activity of the chimpanzee (in Russian). Gift of the authoress, Darwin Museum, Moscow.

SIR HARRY PLATT, Bt., M.D., M.S., F.R.C.S.

DURING SIR HARRY PLATT'S visit to Peru, Chile and Colombia on behalf of the British Council in November and December 1959, he was elected an Honorary Member of the following Societies:

The Peruvian Academy of Surgery
The Society of Surgeons of Chile
The Chilean Society of Orthopaedics and Traumatology.
The Sociedad Latino-Americana de Ortopedia y Traumatologia.

In Memoriam

SIR ARCHIBALD HECTOR McINDOE, C.B.E.
M.Sc., M.S., F.R.C.S., F.A.C.S.

1900—1960

A happy photograph of Sir Archibald, with Mr. Kenneth Moore, taken in the College a week before his death occurred.

IT WAS A very great shock to everyone at the College when we heard of the sudden death of Sir Archibald McIndoe on 11th April 1960.

At the meeting of Council on Thursday, 14th April, the President, after referring to the shattering blow the College had received and the deep sense of personal loss felt by everyone who had known Sir Archibald, asked Mr. C. Naunton Morgan to propose a vote of condolence. Mr. Naunton Morgan spoke thus:

"Mr. President: It is with great sadness and in an atmosphere of unreality that I rise to propose this vote of condolence on the death of Sir Archibald McIndoe. Archie McIndoe was trained, as you know, at the

Mayo Clinic and was destined to become a great General Surgeon. While on a visit to the Clinic, Lord Moynihan saw the worth of Archie McIndoe and promised him a job in England, in fact in London.

" My first encounter with Archie was in 1930, when he came to St. Bartholomew's to work for the Final Fellowship where I was taking a class. I did not realize then that I was teaching someone who was already ' an experienced and skilful surgeon ', because his behaviour as one of a Fellowship Class, a very senior man amongst very junior young post-graduates, was just as one of them. It was only when we became colleagues at the Hospital for Tropical Diseases that I learned of his wide experience and noted his superb technique. I gleaned from Archie McIndoe many sound technical methods in abdominal surgery.

" His work on the liver, the intrahepatic anatomy of the bloodvessels and biliary ducts, is well-known, and we are certain, those of us who knew him as a General Surgeon, that had he continued with General Surgery he would have made exactly the same success in this field as he did in Plastic Surgery.

" Archie's Mother I knew very well and she was an outstanding artist. One of his brothers is a sculptor, and it is therefore not surprising to find that Archie was a good pianist. The artistic trait, I am sure, played a part in his marvellous success in reshaping men's faces and hands and bodies. He soon realized that for a New Zealander aged 32 to come to London having trained in America, it was going to be hard going to practise surgery, and he turned to his cousin, Sir Harold Gillies, the Father of Plastic Surgery, and became in turn his assistant and partner, and finally a superb plastic surgeon. His training in General Surgery made him so. Archie was a perfectionist in everything. I have been thinking in these last few days, when one had time to think, what he had done for Plastic Surgery. I really don't know, because I know little about Plastic Surgery, but I feel that as a perfectionist his achievements in Plastic Surgery have been the perfection of the techniques of that branch of surgery, and I think that it was this that gave him his world-wide reputation.

" What of the Man? I will not speak for long because I realize that you all feel as I do on this sad afternoon. You all know that he was very ambitious, but who is there in this room who is not ambitious? His rise to international fame was attained by his own hard work and without detriment to any of his fellows. He liked men and humanity too much to hurt anyone consciously. His personality was as scintillating as his surgery. He always had a friendly and understanding manner and instilled confidence and the certainty of success into those he met, and I feel sure, having met some of his ex-patients, that it was his personality more than anything else that made him adored by those salvaged airmen of the Guinea Pig Club.

" He had a great sense of humour and liked meeting people and he had the knack of quickly getting to know people. It was his charm and enthusiasm and sincerity, I am convinced, that enabled him to obtain for our College many friends who have magnificently supported our cause. His devotion to this College is well-known to us all and we mourn a great man, a superb surgeon, and a lovable friend.

" Mr. President, I wish to move the following resolution of condolence:

" ' The President and Council of the Royal College of Surgeons of England are stricken with sorrow at the sudden death of their friend and colleague, Sir Archibald McIndoe, and they wish to express their deepest sympathy with his widow and family in their untimely bereavement.

" ' As a Member of Council and as Vice-President, Sir Archibald Hector McIndoe served the College with whole-hearted devotion, and in particular his successful endeavours for the College Appeal will be remembered with admiration and gratitude. As a surgeon of great skill he brought lustre to his chosen specialty, and by his open-hearted friendliness he endeared himself to countless friends in many parts of the world.' "

Sir Arthur Porritt then spoke as follows:

" Mr. President and Gentlemen:

" As Clifford has said, I think all of us here are still very unbelieving of our loss. It is typical of Archie McIndoe's personality that we have used Christian names, because Archie was such a very personable person. I have known him for 40 years. We were students together at Otago University in New Zealand, and at that time in the early twenties he was quite outstanding as a student. He was good-looking, had a good brain, a good physique, and he was a good mixer—all the things that we have come to know so well in his maturity. He was the Beau Brummel of his year, but, as Clifford has said, he had ambition and also vision and he could not see in the small country where he was born that either could be fulfilled. He went to the Mayo Clinic, where I met him again in the late twenties. He worked with Donald Balfour, Howdie Gray, Chuck Mayo and many others that we know and served a real surgical apprenticeship. He must have opened and closed thousands of abdomens, and from that precise work he went into the equally precise and meticulous work of plastic surgery through the gates opened to him by Harold Gillies. I won't deal with his plastic work because you all know of it as well as I do.

" At East Grinstead, and the many other hospitals where he worked, everyone looked on him as a great surgeon, as " the Boss " and as a friend. He was duly and rightly honoured. He was very proud of his knighthood and always said that the only thing wrong with it was ' that my parents gave me the wrong name when I was born '. But it was typical of him that he took the title of ' Sir Archibald ' and carried it.

" The precision in his work was echoed in the precision of his speech, clipped and incisive, and in the clarity of his thought. Everything he did he did 100 per cent.—his work was always a crusade, both at East Grinstead and in this College. With his vast enthusiasm and natural ability, which were his invaluable assets, the work he did for this College produced amazing results. He always seemed so full of energy and so happy, but we all knew he did not relax enough. When on his trips abroad all over the world, every moment he was thinking of people to meet and things to do for this College, and he had very little relaxation in his latter life. His greatest pleasure and real safety-valve was his farm in Kenya, and when that failed him there was no outlet at all.

" I have spoken rather factually, Mr. President, because it would be very easy to be emotional. I am sure that none of us here will ever forget Archie, and I hope that when we are all gone no one in this College will ever forget him because his effort has been tremendous and unique.

" When I was pondering last night of what I might say, I thought of a few words written in his latter days by my Father, who was a surgeon, a simple surgeon, just as Archie for all his complexity was a simple man. My Father knew Archie and liked him. I never knew until after my Father died that he even attempted to write verse, but amongst his effects I found a small book, and looking at it last night I felt that I must just read you a short extract because it would seem to apply so much to Archie.

" I'd like to think when life is done,
That I had filled a needed post:
That here and there I'd paid my fare
With more than idle talk and boast:
That I had taken gifts Divine:
The breath of life and manhood fine,
And tried to use them now and then
In service of my fellow men.

I'd like to think that here and there
When I am gone, there shall remain
A happier spot that might have not
Existed—had I toiled for gain:
That someone's cheery voice and smile
Shall prove that I have been worth while,
That I had paid with something fine
My debt to God for life Divine."

" I am very proud, Sir, and very sad as one of Archie's oldest friends, to join with one of his best friends, Clifford Naunton Morgan, in moving this resolution of condolence."

DONATIONS

During the last month the following generous donations have been received:

Appeal Fund—Donations:

£10,000	Mr. Jack Cotton (further donation towards the endowment of Chair of Biochemistry)
£250	N. M. Rothschild & Sons (further donation)
	H. K. Lewis & Co., Ltd.
£200	Equity & Law Charitable Trust (further donation)
£180	Proceeds from sale of gifts from the late Mr. W. R. Gibson, F.R.C.S.
£100	V. B. Green Armitage, Esq.
£52 10s. 0d.	Springwoods, Ltd.
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	Friern Barnet & Whetstone Townswomen's Guild
10s. 0d.	H. C. Beaumont, Esq. (further donation)

Appeal Fund—Covenants:

£2,142 17s. 1d. p.a. for 7 years	Vickers, Ltd. (further donation)
£1,800 p.a. for 7 years	Geigy Pharmaceutical Co., Ltd.
£26 5s. 0d. p.a. for 7 years + tax	Totley Investment Co., Ltd.
	Baslow Investment Co., Ltd.
£20 p.a. for 7 years + tax	Barnabas Russell, Esq.

Restoration and Development Fund:

£10 10s. 0d.	Miss M. Salmond

Donations for Research Work:

$168	New York Medical College
£71 4s. 3d.	The executors of the late M. H. Wheeler

Voluntary annual subscriptions and donations by Fellows:

The following Fellows of the College, Fellows in Dental Surgery and Fellows in the Faculty of Anaesthetists have generously given donations or have undertaken to make a voluntary annual subscription under Covenant to the College:

Miss G. Barry, F.R.C.S.
A. J. W. Beard, F.F.A.R.C.S.
H. K. Bourns, F.R.C.S.
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W. G. Scott-Brown, C.V.O., F.R.C.S.
J. Sneddon, F.F.A.R.C.S.
V. Eades Vessell, F.F.A.R.C.S.
J. K. Wilson-Pepper, F.R.C.S.

"Week's Good Cause" Broadcast Appeal

The total amount received from the broadcast appeal made by the President on 24th January was £4,128 8s. 0d.

PROCEEDINGS OF THE COUNCIL IN APRIL

AT A QUARTERLY meeting of the Council on 14th April 1960, with Professor Sir James Paterson Ross, Bt., President, in the Chair, a resolution of condolence was passed on the death of Sir Archibald McIndoe, Member of Council and former Vice-President.

Professor G. V. R. Born was admitted as Vandervell Professor of Pharmacology.

The following were elected Fellows of the College without examination as being Medical Practitioners of twenty years' standing:

Dr. Frankis Evans (St. Bartholomew's Hospital; former Dean of the Faculty of Anaesthetists)
Surg. Capt. J. L. S. Coulter, D.S.C., R.N.
Dr. E. F. Scowen (St. Bartholomew's Hospital; Member of Council of the Imperial Cancer Research Fund)
Dr. T. J. Warren, O.B.E. (Brazil)
Prof. E. C. Amoroso, F.R.S. (Royal Veterinary College)
Prof. Jannie Louw (Cape Town)

The following were elected Fellows in the Faculty of Anaesthetists without examination:

J. Boreau (France)
W. G. Cullen (Canada)
J. U. Forbes (Kuwait)
R. Frey (Germany)
M. Prasad (India)

The Jacksonian Prize for 1959 was awarded to Mr. G. Slaney of Birmingham for his essay on "Non-specific Granulomata of the Alimentary Tract". The subject for 1961 will be Tissue Transplantation.

Dr. B. Orban of Chicago was appointed Webb-Johnson Lecturer for the period 1958-1961.

Mr. R. G. Smith, F.R.C.S., was elected Laming Evans Senior Research Fellow in Orthopaedics.

Miss G. V. Gillbe of University College Hospital Dental School was awarded the Evelyn Sprawson Prize for February 1960.

One Diploma of Fellowship in Dental Surgery, one Licence in Dental Surgery and 11 Diplomas in Orthodontics were granted.

Diplomas were granted, jointly with the Royal College of Physicians, in the following subjects:

Ophthalmology (34), *Radio-Diagnosis* (18), *Radiotherapy* (13), *Anaesthetics* (2), *Laryngology and Otology* (1), *Child Health* (122), *Physical Medicine* (3), *Tropical Medicine and Hygiene* (37), *Psychological Medicine* (1), *Industrial Health* (1).

The following hospitals were recognized under paragraph 23 of the Fellowship Regulations:

Hospitals	Posts Recognized		
	General (6 months unless otherwise stated)	Casualty (all 6 months)	Unspecified (all 6 months)
St. Helens—St. Helens Hospital (additional)			H.S. (Orthopaedics)
East Kilbride—Hairmyres Hospital	Surg. Reg. 2 S.H.Os.		
Nottingham—City Hospital (additional)			Surg. Reg. (Thoracic)

DIARY FOR MAY

Fri.	20		Last day for nomination of Candidates for the Council.
		5.00	Board of Faculty of Dental Surgery.
Tues.	24		Last day for nomination of candidates (L.D.S.) for election to the Board of Faculty of Dental Surgery.
Wed.	25		Primary F.R.C.S. Examination begins.

DIARY FOR JUNE

Wed.	1		Final L.D.S. Examination (Part I) begins.
Fri.	3		Voting papers for Council issued.
Sat.	4		College closed.
Mon.	6		Whit Monday. College closed.
Tues.	7		Basic Sciences Lectures and Demonstrations for Dental Students begin.
			Course in Anaesthetics begins.
			Names of candidates (L.D.S.) for election to the Board of Faculty of Dental Surgery announced.
Wed.	8		D.P.H. Examination begins.
		2.30	Ceremony of Presentation of Diplomas.
Thur.	9		Final L.D.S. Examination (Part II) and D.P.M. Examination (Part I) begin.
		2.00	Ordinary Council.
		5.00	Prof. P. M. Weston—Hunterian Lecture—Pathology and treatment of urethral stricture and its complications in Jamaica.
Wed.	15		Primary F.F.A. Examination begins.
Thur.	16		Pre-Medical Examination, D.L.O. Examination (Part I), and D.P.M. Examination (Part II) begin.
Fri.	17		Election of Fellows to the Board of Faculty of Dental Surgery.
			Course in Anaesthetics ends.
Wed.	22	5.00	Miss J. Dobson—Arnott Demonstration—A hitherto undescribed section of John Hunter's Museum.
Thur.	23		British Association of Urological Surgeons Annual Meeting.
			First Membership Examination and D.L.O. Examination (Part II) begin.
Fri.	24		British Association of Urological Surgeons Annual Meeting.
Sat.	25		British Association of Urological Surgeons Annual Meeting.
Tues.	28		Final Membership Examination begins.
Wed.	29	5.00	Board of Faculty of Anaesthetists.

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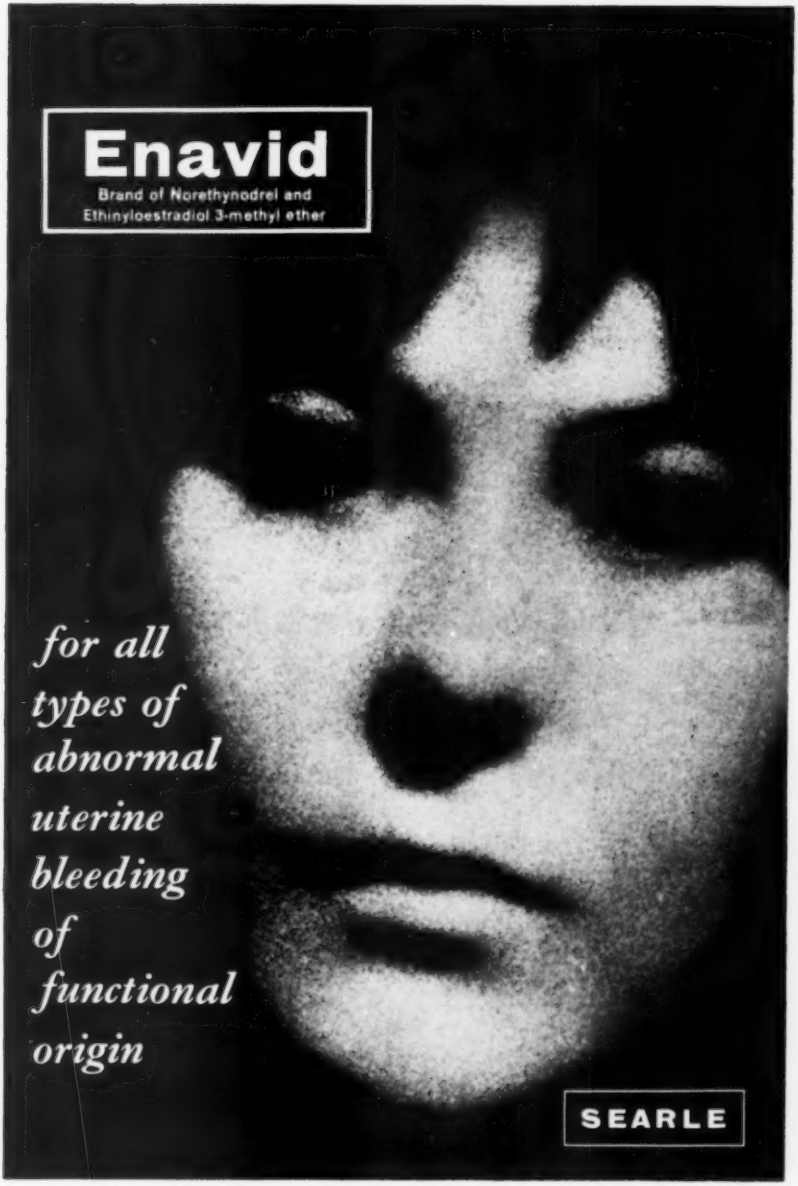
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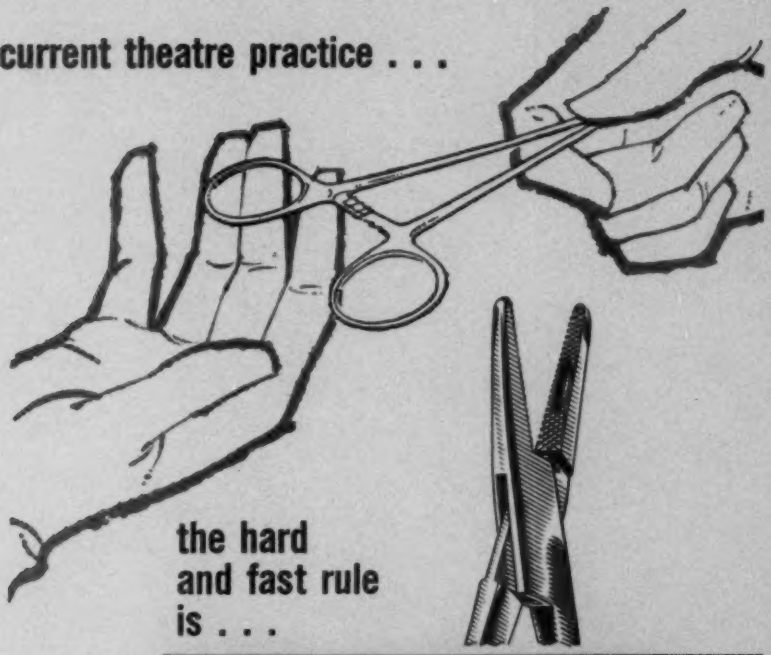

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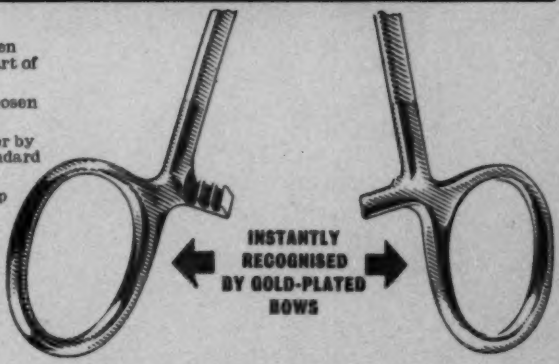

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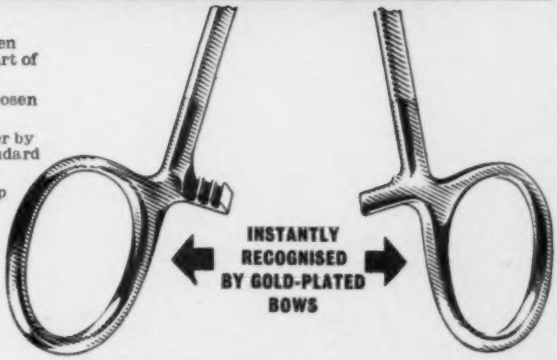
- they incorporate Tungsten Carbide as an integral part of the jaw
- there are no inserts to loosen or fall out
- the jaw facings are harder by far than those of the standard needle-holders
- their lasting positive grip eliminates risk and annoyance of rotation
- they last so much longer



FULL DESCRIPTIVE LITERATURE ON APPLICATION

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N60/191/SH

from the enema

before and after surgery

Further confirmation of the ability of Dulcolax to replace effectively the troublesome enema is given in a recent paper in the Lancet. Rutter[1] observes that '. . . *in traditional surgery practice the number of patients . . . who escape having at least one enema . must be small indeed. In a . . . surgical ward under my care . . . a book is kept to record all enemas given. For the year 1958 . . . this book contains only five entries. The number of patients admitted to the ward during the year was 380 . . . and the saving of nurse-hours, and of patients' discomfort, represented by this outlawing of the enema has been considerable . . . The results with Dulcolax have been gratifying and impressive.*'

Rudd[2] recommends the routine of two Dulcolax tablets at night followed by a Dulcolax suppository in the morning. As shown by Clark[3], such a technique can greatly reduce or abolish the need for enema administration. Similar conclusions are drawn by Jeffcoate[4], Ganz and Zindler[5] and many other investigators in many parts of the world.

Dulcolax is available both in suppository and tablet form.

1 Rutter, A. G., *Lancet*, **1959**, **i**, 1173.
2 Rudd, T. N., *Practitioner*, 1959, **183**, 728.
3 Clark, A. N. G., *Brit. med. J.*, 1957, **2**, 866.
4 Jeffcoate, T. N. A., *Nursing Mirror*, 1958, (Feb) **21**, 13.
5 Ganz, P., and Zindler, M., *Medizinische* No., 1959, **29-30**, 1042.

DULCOLAX*

(4,4¹-diacetoxy-diphenyl)-(pyridyl-2)-methane

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